

UNITED STATES ATOMIC ENERGY COMMISSION

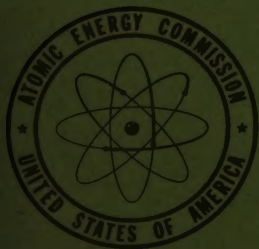
Nuclear Science Abstracts

QUARTERLY CUMULATIVE INDEX

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GUIDE TO ABSTRACT WRITING

1. *Purpose.* It is very important that a paper be accompanied by an abstract, preferably appearing at the beginning. This abstract is not part of the paper—it is an adjunct intended to convey briefly the content of the paper, to draw attention to all new information and to the main conclusions. It should be directly informative, not merely indicative.

2. *Style of Writing.* The abstract should be written concisely and in normal rather than abbreviated English. Where possible, standard terms should be used and unnecessary contracting should be avoided. The third person is preferable. Mixed tenses, and both indicative and imperative forms should be avoided.

It should be presumed that the reader has some knowledge of the subject, but has not read the paper. He may not even have the paper available at all, if he is working with the abstract journal only. The abstract should, therefore, be intelligible in itself, without reference to the paper; for example, it should not cite sections or illustrations as a substitute for a statement of their content.

3. *Content.* The title of the paper is usually read as part of the abstract, therefore repetition of the title in the opening sentence of the abstract should be avoided. If the title is insufficiently comprehensive to indicate the subjects covered or the objects of the investigation, the opening sentence should make this clear.

The abstract should state newly observed facts, conclusions of an experiment or argument and, if possible, the essential parts of any new theory, treatment, apparatus, technique, etc.

It should contain the names of any new compound, and any new numerical data, such as physical constants; if this is not possible it should draw attention to them. It is important to refer to new items and observations, even though they may be incidental to the main purpose of the paper.

When giving experimental results, the abstract should indicate the methods used; for new methods, the basic principle, range of operation, and degree of accuracy should be given.

4. *Detail of Layout.* It is impossible to recommend a standard length for an abstract. It should, however, be concise and should not normally exceed 200 words. References should be omitted from the abstract whenever possible.

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The printing of this publication has been approved by
The Director of the Bureau of the Budget, August 2, 1951.

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MR			4521	7-2898	0.10
17	6-6596	\$1.00	ORNL		
MTA			90	4-88	Anal. Chem. 21, 1239-41(1949)
13	7-3586	Phys. Rev. 91, 342-4(1953)	884	5-1127	Proc. Phys. Soc. (London) 66A, 590-6(1953)
14	7-3074	\$0.45	914	6-4482	\$0.25
NAA-SR			1142	6-3875	0.25
212	7-2395	Phys. Rev. 90, 1054-7(1953)	1313	7-3041	0.35
224	7-3008	Nucleonics 11, No. 7, 53-6(1953)	1324	6-5231	0.20
NP			1340	6-5650	0.20
1884	5-967	Can. Chem. Process Inds. 35, 397-8, 400-6(1951)	1411	7-2239	0.80
3057	5-3695	J. Am. Chem. Soc. 73, 4727-9(1951)	1459	7-2422	2.25
3794	6-4120	Anal. Chem. 25, 541-9(1953)	1479	7-3159	0.35
3817	6-4019	J. Phys. Chem. 57, 149-52(1953)	1525	7-3501	0.10
3935	6-4642	Arkiv Fysik 6, 57-68(1953)	1538	7-3720	0.20
3999	6-5567	J. Am. Chem. Soc. 75, 2467-70(1953)	ORO		
4105	6-6304	Can. J. Phys. 31, 613-28(1953)	82	7-535	J. Chem. Phys. 21, 1060-69(1953)
4223	7-812	Rev. Sci. Instr. 24, 371-4(1953)	85	7-1602	Phytopathology 43, 236-8(1953)
4361	7-1995	Welding J. 32, 283-s-91-s(1953)	91	7-2943	\$0.35
4421	7-2586	Anal. Chem. 25, 718-21(1953)	SO		
4504	7-3117	Phys. Rev. 90, 716-17(1953)	3252	7-2847	\$0.25
4564	7-887	Nucleonics 10, No. 11, 72-4(1952)	SUI		
NRC			53-1	7-1701	Nuovo cemento (9) 10, 630-47(1953)
2611	6-5790	\$0.20	TID		
NSF-tr-			3010(Suppl. 1)	7-2819	\$0.20
2	7-4695	\$0.10	3036	7-3148	0.60
3	7-4599	0.10	5118	7-4242	0.60
4	7-4696	0.10	UCLA		
5	7-4697	0.10	47	4-1825	J. Biol. Chem. 185, 519-24(1950)
9	7-4600	0.10	218	6-5909	Nature 171, 487(1953)
11	7-4646	0.10	223	6-5931	Proc. Soc. Exptl. Biol. Med. 82, 665-8(1953)
NYO			227	6-6050	Rev. Sci. Instr. 24, 459-60(1953)
1577	6-6414	\$0.55	229	7-51	Arch. Ind. Hyg. and Occupational Med. 7, 217-20(1953)
3024	7-2922	Phys. Rev. 90, 606-8(1953)	235	7-1034	Arch. intern. pharmacodynamie 93, 341-53(1953)
3068	7-3010	Anal. Chem. 24, 1985(1952)	236	7-737	J. Am. Pharm. Assoc. Sci. Ed. 42, 296-300(1953)
3071	6-3351	\$0.60	247	7-2489	\$0.35
3144	7-2551	0.60	UCRL		
3164	7-4041	NSA	1635	6-2597	Nucleonics 10, No. 4, 14-17 and No. 5, 14-19(1952)
3221	6-5913	Phys. Rev. 90, 853-7(1953)	1753	7-2612	Rev. Sci. Instr. 24, 552-3(1953)
3265	7-2589	Phys. Rev. 89, 977-81(1953)	1809	6-4562	Rev. Sci. Instr. 24, 462-3(1953)
			1863	7-1631	J. Am. Chem. Soc. 75, 2459-64(1953)
			1898	6-6577	J. Am. Chem. Soc. 75, 1859-63(1953)
			1930	6-4503	Rev. Sci. Instr. 24, 388-90(1953)
			1996	7-978	Phys. Rev. 90, 633-43(1953)
			1997	7-3817	\$0.25

Report	Abstract	Availability	Report	Abstract	Availability
UCRL	NSA		UR	NSA	
2036	7-2826	\$0.20	205(p.60-71)	6-4700	<u>Part in Biochim et Biophys. Acta 10, 349-54(1953)</u>
2040	7-2764	0.25	213(p.55)	6-5541	<u>Am. J. Physiol. 171, 762(1952)</u>
2049	7-2843	0.20	214	6-5542	<u>Arch. Biochem. and Biophys. 44, 18-29 (1953)</u>
2051	7-3495	0.20	218	7-23	<u>Am. J. Anat. 92, 391-431(1953)</u>
2056	7-3304	0.90	219	7-24	<u>Am. J. Anat. 92, 433-49(1953)</u>
2076	7-2364	0.10	221	7-1047	<u>J. Lab. Clin. Med. 41, 918-28(1953)</u>
2077	7-2340	<u>Phys. Rev. 90, 682-9(1953)</u>	225	7-758	<u>Arch. Ind. Hyg. and Occupational Med. 7, 319-25(1953)</u>
2088	7-3160	\$0.20	237	7-2946	<u>Am. J. Physiol. 173, 41-6(1953)</u>
2091	7-2899	0.45	240	7-4002	<u>J. Gerontol. 8, 146-9(1953)</u>
2098	7-2656	<u>Phys. Rev. 90, 499-500(1953)</u>	243	7-3322	<u>Proc. Soc. Exptl. Biol. Med. 82, 67-70 (1953)</u>
2116	7-3030	<u>J. Am. Chem. Soc. 75, 1867-8(1953)</u>			
2117	7-3231	\$0.20	USNRDL		
2120	7-3837	<u>Phys. Rev. 90, 723-4(1953)</u>	380	7-2961	<u>Arch. Ind. Hyg. and Occupational Med. 7, 508-15(1953)</u>
2126	7-3285	\$0.10			
2154	7-3404	0.25	WASH		
2170	7-3921	<u>Phys. Rev. 90, 1129-30(1953)</u>	129	7-2799	\$1.15
2173	7-3261	<u>Phys. Rev. 90, 1124-5(1953)</u>			
UR					
191	6-2823	<u>Pediatrics 11, 294-303(1953)</u>			

NEW NUCLEAR DATA

The New Nuclear Data presented here has been prepared by the Nuclear Data Group which has been re-organized under the sponsorship of the National Research Council with the support and cooperation of the National Bureau of Standards. The literature coverage has been continuous with that of the past. New Nuclear Data lists will not appear in the fall numbers of NSA. However, in this period the group will be at work on current data for inclusion in a 1953 cumulation which will appear in Vol. 7, No. 24B.

Summary of New Nuclear Data on Half Lives, Radiations, Relative Isotopic Abundances, Nuclear Moments, Neutron Cross Sections, Reaction Energies, and Masses.

Prepared by National Research Council Nuclear Data Group with assistance of Readers.

National Research Council Group: K. Way, A. L. Hankins, R. W. King, C. L. McGinnis, and M. Wood.

Leaders of groups in other laboratories which are assisting with the abstracting: G. Scharff-Goldhaber, Brookhaven National Laboratory; J. M. Hollander, University of California; C. S. Wu, Columbia University; P. Axel, University of Illinois; A. C. G. Mitchell, L. M. Langer, University of Indiana; J. R. Stehn, Knolls Atomic Power Laboratory; H. Pomerance, Oak Ridge National Laboratory; E. O. Wieg, R. W. Fink, University of Rochester; W. E. Meyerhof, Stanford University; L. Slack, Naval Research Laboratory.

ABBREVIATIONS

a	absorption measurement	E_{dis}	disintegration energy
$a\beta\gamma$	absorption of β 's in coincidence with γ 's	EA	electrostatic analyzer
ace^-	absorption of conversion electrons	$E1, E2, \dots$	electric dipole, electric quadrupole
a coin	measurement by placing absorbers between counters in coincidence	ϵ	electron capture
α	total γ -ray conversion coefficient, N_e/N_γ	ϵ_K, ϵ_L	electron capture from K, L shell
$\alpha_K, \alpha_L, \dots$	γ -ray conversion coefficient for electrons ejected from the K, L, ... shell	f	fission, in abbreviations for methods of production or detection
b	coefficient in angular correlation function, $1 + b \cos^2 \theta$	F-K	Fermi-Kurie β energy distribution plot
B	band spectra method	$\gamma(\theta, T)$	numbers of γ 's as function of angle and temperature
$Beyn$	measurement by detection of photoneutrons from Be	Γ	resonance half-width (the whole width at half-maximum)
$\beta\gamma, \gamma\gamma$	$\beta\gamma$ or $\gamma\gamma$ coincidences	g.s.	ground state
$\beta\gamma(\theta)$	angular correlation of β 's and γ 's in coincidence	I	(1) spin in units of $\hbar/2\pi$; (2) nuclear induction magnetic resonance method
Calc	calculated value from experimental work reported elsewhere	ic	ionization chamber
cc	cloud chamber	J	quantum state of compound nucleus in a nuclear reaction. "I" is used to denote the spin of the target nucleus, final nucleus
ce^-	conversion electrons	K/L	α_K/α_L
chem	chemical separation of product following reaction	l	angular momentum of particle absorbed into nucleus
Cpt	Compton electrons	M	molecular or atomic beam resonance method
d	(1) deuteron, (2) descendant of, (3) days, when used as superscript	$M1, M2, \dots$	magnetic dipole, magnetic quadrupole ...
$d, p(\theta)$	angular distribution of protons with respect to deuteron beam	mb	millibarns
$D\gamma n, D\gamma p$	measurement by detection of photoneutrons or photoprotons from deuterium	Mic	microwave method
\bar{E}	average energy	mir	measurement by total reflection of neutron beam from mirror surface
E_0	resonance energy	ms	mass spectrometer
E_β, E_γ, \dots	energy of β ray, energy of γ ray, ...	μ	(1) magnetic moment in units of nuclear magnetons, (2) micron, 10^{-4} cm

μs	microseconds
osc	pile oscillator method
p	(1) proton, (2) predecessor of
para	paramagnetic resonance method
pc	proportional counter
pe ⁻	photo electrons
ppl	photoplates or emulsions
q	electric quadrupole moment in units of barns
Q	reaction energy in Mev
s	(1) spectrometer method, (2) seconds, when used as superscript
S	atomic-spectra measurement
scin	scintillation counter
sl	lens spectrometer
sl;ce ⁻	conversion electrons measured in lens spectrometer
st	strong
s π	180° spectrometer
s $\pi\sqrt{2}$	double focusing spectrometer
σ	cross section in barns

σ_0	cross section at resonance energy, E_0
σ_a	absorption cross section
σ_{el}	elastic scattering cross section
σ_{in}	inelastic scattering cross section
σ_s	scattering cross section
σ_t	total cross section
t	triton, H^3
τ	half life in units indicated
τ_1, τ_2	half life of upper, lower state
th	thermal
w,vw	weak, very weak
(0.123)	β and γ energy values enclosed in parentheses are given for identification purposes
%	% of disintegrations
†	relative numbers. When used in connection with γ rays, relative numbers of photons, not photons plus conversion electrons, are meant
+, -	even, odd parity

Standard journal abbreviations are used.

All energies are given in Mev and all cross sections in barns unless otherwise stated in the tabular material.

MAGNETIC MOMENT STANDARDS

In order to have a consistent basis for recording data on magnetic moments, results have been based on the following values and are without diamagnetic corrections.

$\mu(H^1) = 2.7934$ nuclear magnetons

This value has been adopted arbitrarily because it is the one used as a base in the Table of H. L. Poss, The Properties of Atomic Nuclei, I. Spins, Magnetic Moments and Electric Quadrupole Moments. (Revised, BNL-26 (T-10), (unclassified).) The values reported in the New Nuclear Data summaries are thus directly comparable with those listed in the survey of Poss.

$\nu(Na^{23})/\nu(H^1) = 0.26450$ E. Bleuler, M. Gabriel, Helv. Phys. Acta **20**, 67(1947).

$\nu(D)/\nu(H^1) = 0.153506$ F. Bloch, E. C. Levinthal, M. E. Pachard, Phys. Rev. **72**, 1125(1947).

$\nu(B^{11})/\nu(H^1) = 0.320827$ D. A. Anderson, Phys. Rev. **76**, 434(1949).

NEW NUCLEAR DATA

H^2	μ	0.857608	I
1 1	$\mu(D) / (H^1) = 0.307012192 \pm 0.000000015$		$H^1 H^2$
	T.F. Wilmott, <u>Phys. Rev.</u> 91 , 499A(1953).		
	Capture γ	$H^1(n, \gamma)$	$E_n = th$ scin
		2.23	
	No lower energy γ 's observed		
	A. Bracci, U. Facchini, A. Malvicini, <u>Phys. Rev.</u> 90 , 162(1953); <u>Nuovo Cim.</u> 10 , 949(1953).		
He^4	$H^3(d, n)$	$E_d = 0.20$	ppl
2 2	No level between 1 and 13 Mev ($\sigma/\sigma_{g.s.} < 0.015$)		
	L. Rosen, <u>Nucleonics</u> 11 , No. 8, 38(1953).		

H^3	$H^3(p, n) He^3$	$E_p = 1$ to 5
$2H^2$	Broad max. at ~ 3 long counter	
	$p, n(\theta)$ indicates $l_p = 1$ predominant	
	H.B. Willard, J.K. Bair, J.D. Kington, <u>Phys. Rev.</u> 90 , 865(1953).	
	$H^3(p, \gamma)$	$E_p = 1$ to 5.2
	No resonance for production of ~ 20 -Mev γ 's	
	Yield curve flattens at $E_p \sim 3.5$ scin	
	H.B. Willard, J.K. Bair, J.D. Kington, <u>Phys. Rev.</u> 90 , 865, (1953).	

${}^5_2\text{He}$	Levels	$\text{Li}^7(\text{d},\alpha)$	$E_d = 0.98$	dpl
		g.s.	$\Gamma = 0.3$	
		2.5	$\Gamma = 1.5$	

P. Cüer, J. J. Jung, Compt. rend. 236, 1252 (1953).

${}^6_2\text{He}$	(β) (Li^6) (θ), Li^6 time of flight spectra, suggest β -neutrino angular correlation of tensor interaction
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J. S. Allen, W. K. Jentschke, Phys. Rev. 89, 902A (1953).

(β) (Li^6) (θ) indicates tensor predominates over axial vector interaction $\text{No}(\sim 3\%)$

B. W. Rustad, S. L. Ruby, Phys. Rev. 89, 880 (1953).

${}^{15}_3\text{Li}$	Level	$\text{He}^3(\text{d},\text{p})\text{He}^4$	$E_d = 0.26$ to 3.6	
		16.80	$J = 3/2 +$	scin

$\sigma_{\text{max}} = 0.90$ for $E_d = 0.43$

J. L. Yarnell, R. H. Lovberg, W. R. Stratton, Phys. Rev. 90, 292 (1953).

${}^{16}_3\text{Li}$	No reaction	$\text{Li}^6(\gamma, \text{d})\text{He}^4$		pc
	$\sigma < 3.5 \times 10^{-3}$ for $E_\gamma = 2.62$		enriched Li^6	

P. Jensen, K. Gls, Z. Naturf. 8a, 137 (1953).

${}^{17}_3\text{Li}$	Level	$\text{Be}^9(\text{d}, \alpha\gamma)$	$E_d = 0.40$	scin
	$\alpha, \gamma(\theta)$	(0.478) $I = 1/2$		

R. G. Uebergang, N. W. Tanner, Australian J. Sci. Res. 6A, 53 (1953).

Resonances	$\text{Li}^7(\gamma, \text{t})\text{He}^4$	$E_\gamma \leq 15$	dpl
	5.25	$\sigma \sim 0.02$ mb	
	7.25	$\sigma = 0.13$ mb	
	9.25	$\sigma \sim 0.02$ mb	

P. Stoll, M. Wächter, Nuovo Cim. 10, 347 (1953).

$\text{Li}^6(\text{n}, \text{t})\text{He}^4$	$E_n = 0.2$ to 0.6
	$\text{n}, \text{t}(\theta)$ shows $I_n = 0$ and 1 predominant

dpl

L. E. Darlington, J. Haugsnes, H. M. Mann, J. H. Roberts, Phys. Rev. 89, 892A; 90, 1049 (1953).

${}^{18}_3\text{Li}$	τ	0.89 ^B	$\text{Li}(0.53\text{-Mev d})$	
	(12.5 β) (1.5 α) (θ) indicates $I = 7-, >0, 0$			

No 4.9 γ (<0.8% of Li^8 decays)

D. S. Bunbury, Phys. Rev. 90, 1121 (1953).

${}^7_4\text{Be}$	$\text{Li}^7(\text{p}, \text{n})\text{Be}^7$	EA
	Threshold 1.8816 \pm 0.0010	

$\text{Li}^7(\text{p}, \text{n})$ thresh/ $\text{Mg}^{24}(\text{p}, \text{p}\gamma)$ thresh = 1.3737 \pm 0.0005

K. W. Jones, M. T. McEllistrem, R. A. Douglas, M. T. Richards, Phys. Rev. 91, 482A (1953).

τ (metal)	53.61 ^d	$\text{Li}(8.5\text{-Mev p})$
Counted for 5 months		differential ic
τ dependent on chemical state		

J. J. Kraushaar, E. D. Wilson, K. Y. Balnbridge, Phys. Rev. 90, 610 (1953).

${}^8_4\text{Be}$	τ	$< 5 \times 10^{-14}$ s	$0^{16}(\leq 27\text{-Mev } \gamma)$
	From analysis of 38 α -stars		

C. H. Millar, A. G. W. Cameron, Can. J. Phys. 31, 723 (1953).

${}^8_4\text{Be}$	Levels	$\text{B}^{10}(\gamma, \text{d})$	$\text{B}^{11}(\gamma, \text{t})$	
		2.2	4.0	$E_\gamma \leq 32$ dpl
		2.9	4.9	
		3.4	6.8	

All α emitting levels

P. Erdős, P. Scherrer, P. Stoll, Helv. Phys. Acta 26, 207 (1953).

Levels	$\text{B}^{11}(\text{p}, \alpha)$	$E_p = 0.163$	
	2.2	4.0	dpl, pc
	2.9	4.9	
	3.4		

H. Glättli, P. Stoll, Helv. Phys. Acta 26, 428 (1953).

Levels	$\text{B}^{10}(\text{d}, \alpha)$	$E_d = 1.0$	s
	2.87	$\Gamma = 0.9$	
	4.17		
	5.0		
	7.5		

All α emitting levels $\text{B}^{10}(\text{d}, 3\alpha) < 5\%$

P. Cüer, J. J. Jung, Compt. rend. 236, 2401 (1953).

Levels	$\text{C}^{12}(\gamma, \alpha)$	$E_\gamma \geq 26$	dpl
	$\gamma\alpha(\theta)$	2 $^+$ g.s.	
	$\alpha\alpha(\theta)$	10 $^+$ (3-16)	
		12 $^+$ 16.47	
		56 $^+$ 16.8 $J=2^+$ $\Gamma < 0.3$ $T=1$	

20 $^+$ 17.6 $J=(2 \text{ or } 4)^+$ $\Gamma < 0.3$ $T=1$

$\gamma/\alpha < 0.25$ for 16.8 and 17.6 levels

Initial α 's from $> 25\text{-Mev}$ levels in C^{12}

J. J. Wilkins, F. K. Goward, Proc. Phys. Soc. 66A, 661 (1953).

Levels
See C^{12}

D. L. Livesey, C. L. Smith, Proc. Phys. Soc. 66A, 689 (1953).

${}^9_5\text{B}$	Level	$\text{Be}^9(\text{p}, \text{n})$	$E_p = 6.59$	dpl
		2.37		

F. A. J. Aizenberg, C. M. Braams, W. W. Suechener, Phys. Rev. 91, 674; 91, 463A (1953).

${}^{10}_5\text{B}$	q	± 0.099	$\text{B}(\text{CH}_3)_3$ quad res

H. G. Dehmelt, Z. Phys. 134, 642 (1953); 133, 528 (1952).

Capture γ 's	$\text{Be}^9(\text{p}, \gamma)$		scin
	7.48 level	$E_p = 0.998$	
	26 $^+$ 0.41	26 $^+$ 1.4	
	228 $^+$ 0.72	7.5	

7.56 level	$E_p = 1.087$		
	108 $^+$ 0.71	17 $^+$ ~ 2	
	5 $^+$ 1.4	98 $^+$ 6.8	

No 0.41 γ (<0.5 γ) No 1.02 γ (<5 γ) No 7.56 γ

W. F. Hornyak, T. Coor, Phys. Rev. 91, 463A (1953); verbal report.

B^{10}

5 5

$\gamma\gamma$ $Be^9(d,n)$ scin
(1.02 γ) (0.72 γ) (1.43 γ , 2.87 γ) (0.72 γ)
S.W.Shafroth, S.S.Hanna, Phys. Rev. 91, 483A (1953).

Levels	$Be^9(d,n)$	$E_d = 0.60$	dpl
130†	g.s.	200†	2.20
380†	0.73	80†	2.85
25†	1.75	170†	3.64

† rel σ at 90°

A.J.Dyer, J.R.Bird, Australian J. Phys. 6, 45 (1953).

 B^{11}

5 6

q +0.047 $B(CH_3)_3$ quad res
H.G.Dehmelt, Z.Phys. 134, 642 (1953); 133, 528 (1952).

Levels	$C^{13}(d,\alpha\gamma)$	$E_d = 1.8$	pair s
γ 's	4.50		
	4.96		

R.P.Bent, T.W.Bonner, R.F.Sipple, Phys. Rev. 91, 472A (1953); verbal report.

Levels	$B^{10}(d,p)$	$E_d = 4.25$ to 8.52	sm
	7.99	9.19	
	8.57	9.28	
	8.93	10.32	double?

M.W.Elkind, A.Sperduto, Phys. Rev. 91, 463A (1953); verbal report.

Levels	$Be(d,n)$	$E_d = 0.96$	dpl
$d, n(\theta)$	~ 16.7	$J = 3/2^+$	
	~ 16.7	$J = 5/2^-$	

J.S.Pruitt, S.S.Hanna, C.D.Swartz, Phys. Rev. 91, 463A (1953).

 B^{12}

5 7

Levels	$B^{11}(d,p)$	$E_d = 4.25$ to 8.52	sm
	0.95	2.72	
	1.67	3.38	
	2.62		

M.W.Elkind, A. Sperduto, Phys. Rev. 91, 463A (1953); verbal report.

 C^{12}

6 6

γ 's $Be^9(\alpha, n\gamma)$
3† 3.16
100† (4.43)

No 7.6 γ (< 0.04†)

L.E.Beghian, H.H.Halban, T.Husain, L.G.Sanders, Phys. Rev. 90, 1129 (1953).

Levels	$C^{12}(\gamma, 3\alpha)$	$E_\alpha \leq 70$	dpl
40†	12.7	110†	19.5
35†	13.8	35†	20.7
115†	15.0	130†	21.9
110†	15.9	30†	23.2
125†	16.8	230†	24.3
190†	17.3	130†	25.4
330†	18.3	270†	26.5
130†	18.9	st	29.4

F.K.Goward, J.J.Wilkins, Proc. Roy. Soc. 217A (1953); Proc. Phys. Soc. 65A, 671 (1952).

 C^{12}

6 6

$B^{11}(p, \gamma) C^{12}$ EA
Resonance 0.1638 \pm 0.0002 $\Gamma = 0.0073$
Level 16.099 absolute measurement
S.E.Hunt, W.M.Jones, Phys. Rev. 89, 1283 (1953).

Levels	$B^{11}(p, \alpha)$	$E_p = 0.4$ to 2.8 s
Yield†	Level	J
35.4/0.04	16.57	2-
8.8/1.0	17.22	2+
2.3/1.4	17.8	0+?
110.5/2.6	18.3	0.30

† Relative yield ($Be^9 3$ -Mev level) / ($Be^8 g.s.$) α 's

E.B.Paul, R.L.Clarke, Phys. Rev. 91, 463A (1953).

Levels	$B^{11}(p, \gamma)$	$E_p = 0.6$ to 2.8
$p, \gamma(\theta)$	(16.57) $J=2-$	s
	(17.22) $J=(2+)$	
	17.8 $J=0+$	
	18.3 $J=2+$	

H.E.Gove, E.B.Paul, Phys. Rev. 91, 463A (1953); verbal report.

$O^{16}(\gamma, 4\alpha)$ $C^{12}(\gamma, 3\alpha)$ $C^{12}(n, n' 3\alpha)$
Levels in O^{16}, C^{12}, Be^8 connected by α emission

O^{16}	C^{12}	Be^8	dpl
20-24	9.6	g.s.	
20-24	11.3	g.s.	
20-24	12	~ 3	
—	15-19	~ 3	
—	>25	~ 17	
25	—	~ 4.3	$O^{16} \rightarrow 2Be^8?$
28-30	16	~ 37	

 $E_\gamma \leq 26$ to 32

D.L.Livesey, C.L.Smith, Proc. Phys. Soc. 66A, 689 (1953).

 $O^{16}(\gamma, 4\alpha)$ $E_\gamma \leq 48$ dplReaction proceeds 90% via 16-Mev C^{12} level for $E_\gamma > 25$

C.A.Hsiao, V.L.Telegdi, Phys. Rev. 90, 494; 91, 473A (1953).

$C^{12}(\gamma, \alpha) Be^8$ $E_\gamma \leq 27$ dpl
 $\sigma(Be^8 g.s.) / \sigma(Be^8 \sim 3$ -Mev level) = ~ 0.09

C.H.Millar, A.G.Cameron, Can. J. Phys. 31, 723 (1953).

 C^{13}

6 7

Levels	$C^{12}(d, p)$	$E_d = 7.86$	dpl
$d, p(\theta)$	g.s. $I_n = 1$	$\sigma = 0.09$	
	(3.09) $I_n = 0$	$\sigma = 0.12$	

J. Catalá, F.Senent, J. Casanova, Anales real soc. españ. fis. y quim. 49A, 91 (1953).

Capture γ $C^{12}(n, \gamma)$ pair s
4.949 \pm 0.006

B.B.Kinsey, G.A.Bartholomew, Can. J. Phys. 31, 537 (1953).

6C^{13} 7	Levels	$\text{Be}^9(\alpha, n)\text{C}^{12}$	$E_\alpha \approx 3.0$	scin
	Level	E_0		
	11.98	1.90		
	w 12.50	2.65		

F.L.Talbott, N.P.Heydenburg, Phys. Rev. 90, 186 (1953).

6C^{14} 8	F-Kplot linear to 25 kev	s
	C.S.Wu, A.Schwarzschild, Phys. Rev. 91, 483A (1953)	

$\text{C}^{13}(\text{d}, \text{p})$ $E_d = 1.8$ pair s
No 4.1 pair emitting level found

R.D.Bent, T.W.Bonner, R.F.Sipple, Phys. Rev. 91, 472A (1953).

Levels	$\text{C}^{13}(\text{d}, \text{p})$	$E_d = 4.08$	ppl
d, p(θ)	(8.1) $l_n = 0$		
	R.E.Benenson, Phys. Rev. 90, 420 (1953).		

7N^{13} 6	Resonance	$\text{C}^{12}(\text{p}, \gamma)\text{N}^{13}$	EA
	Level	0.4568 ± 0.0005 $\Gamma = 0.040$	
		2.367 absolute measurement	
		S.E.Hunt, W.M.Jones, Phys. Rev. 89, 1283 (1953).	

7N^{14} 7	Levels	$\text{C}^{13}(\text{d}, \text{n})$	$E_d = 3.89$	ppl
	d, n(θ)	Level l_n		
		2.2 1		
		3.85 1		
		4.80 0		
		4.97 1?		
		5.5 0?		
		5.76		
		6.1		
		6.23		
		6.43		
		7.00 1?		
		7.50 0?		
		8.08		

R.E.Benenson, Phys. Rev. 90, 420 (1953).

Capture γ 's	$\text{C}^{13}(\text{p}, \gamma)$	$E_p = 0.554$	scin
$\sim 25^\circ$	2.35 $\sim 10^\circ$	4.45	
$\sim 10^\circ$	2.75 $\sim 4^\circ$	5.1	
$\sim 15^\circ$	3.05 100°	(8.08)	

D.Hicks, T.Husain, L.G.Sanders, L.E.Beghian, Phys. Rev. 90, 163 (1953).

γ 's	$\text{C}^{13}(\text{d}, n\gamma)$	$E_d = 1.8$	pair s
	3.36 5.72		
	5.13 6.147		

R.D.Bent, T.W.Bonner, R.F.Sipple, Phys. Rev. 91, 472A (1953); verbal report.

Levels	$\text{N}^{14}(\alpha, \alpha')$	$E_\alpha = 21.2$	a
	4.10 7.03		
	5.22 7.95		
	5.72 8.64		
	6.01 9.23		

2.31 level not observed (isotopic spin forbidden)

B.W.Carmichael, M.B.Sampson, O.E.Johnson, Phys. Rev. 91, 473A (1953); verbal report.

7N^{14} 7	Levels	$\text{C}^{13}(\text{p}, \text{n})\text{N}^{13}$	$E_p = 3.2$ to 5.0	pc
	Levels	E_0	Γ	
	11.05	3.78	0.10	
	11.26	4.01	0.02	
	11.35	4.10	0.15	
	11.44	4.18	0.03	
	11.74	4.52	0.12	
	12.0	4.8	0.10	

J.K.Bair, J.O.Kington, H.B.Willard, Phys. Rev. 90, 575 (1953).

Levels	$\text{B}^{10}(\alpha, p)\text{C}^{13}$	$E_\alpha \approx 3.0$	scin
	Level E_0		
	12.68	1.50	
	12.77	1.63	
	12.81	1.68	
	12.92	1.83	
	13.17	2.16	
	~ 13.23	~ 2.27	
	~ 13.72	~ 2.95	

F.L.Talbott, N.P.Heydenburg, Phys. Rev. 90, 186 (1953).

7N^{15} 8	Levels	$\text{N}^{14}(\text{d}, \text{p})$	$E_p = 5$ to 8	s
		7.58 9.16	10.53	
		8.31 10.06	10.69	
		8.57 10.45	10.80	
		9.05		

A.Sperduto, W.W.Buechner, M.M.Elkind, W.J.Fader, Phys. Rev. 473A (1953); verbal report.

Levels	$\text{C}^{14}(\text{p}, \text{n})$
d, n(θ)	(11.294) $J = 1/2(-?)$
	(11.429) $J = 1/2+$
	(12.096) $J = 5/2-$
	(12.147) $J = 3/2-$
	(12.327) $J = 5/2+$

R.Kay, H.Mark, C.Goodman, Phys. Rev. 91, 472A (1953); verbal report.

Levels	$\text{N}(\text{n}, \text{n})\text{N}$	pc
n, n(θ)	(12.327) $l_n = 1$	
	(12.494) $l_n = 2$	

J.L.Fowler, C.H.Johnson, J.R.Risser, Phys. Rev. 91, 441A (1943); verbal report.

7N^{16} 9	No 1.0 γ (<5% of 6.0 γ)	O(fast n) scin
	F.Boehm, D.C.Pearlee, V.Perez-Mendez, Phys. Rev. 90, 1119 (1953).	

8O^{16} 8	γ 's	$\text{F}^{19}(\text{p}, \alpha\gamma)$	$E_p = 0.874, 0.935$	scin
		(6.91 γ) / (possible 0.78 γ from 6.91 level) ≥ 200		
		(7.12 γ) / (possible 0.98 γ from 7.12 level) ≥ 120		
		(7.12 γ) / (possible 1.06 γ from 7.12 level) ≥ 100		
		Results consistent with small T=1 admixture in levels involved (expected from Coulomb perturbation)		

D.H.Wilkinson, G.A.Jones, Phil Mag. 44, 542 (1953)

80_{8}^{16} Level $F^{19}(p,\alpha\gamma)$ $E_p = 0.34$ $\alpha\gamma$
 γ (8.13) $\tau \leq 10^{-9}$ s
 S. Gorodetzky, R. Armbruster, A. Gallmann, A. Knipper
 T. Müller, Compt. rend. 237, 45 (1953).

Levels $C^{12}(\alpha,\alpha)C^{12}$ $E_\alpha = 0.5$ to 4 pc
 $\alpha,\alpha(\theta)$ 9.58 $J = 1-$ $\Gamma = 0.880$
 9.84 $J = 2+$ $\Gamma = 0.001$

R.W. Hill, Phys. Rev. 90, 845 (1953).

Levels $N^{15}(p,\alpha)C^{12}$
 $\sigma(E)$ 12.43 $J = 1-$
 13.09 $J = 1-$
 W.A. Fowler, R.G. Thomas, Phys. Rev. 91, 473A (1953)

Reaction $O^{16}(\gamma,\alpha)C^{12}$ $E_\gamma \leq 27$ $dp1$
 $\gamma\alpha(\theta)$ isotropic; excited states of C^{12} involved.
 C.H. Millar, A.G.W. Cameron, Can. J. Phys. 31, 723 (1953).

See C^{12}
 D.L. Livesey, C.L. Smith, Proc. Phys. Soc. 66A, 689 (1953); C.A. Hsiao, V.L. Telegdi, Phys. Rev. 90, 494 (1953).

F^{17} Levels $O^{16}(p,p')F^{17}$ $E_p = 0.28$ to 4.6
 $9\ 8$ $D,p'(\theta)$ (3.11) $J = 1/2-$ pc
 (3.88) $J = 7/2-$

F.J. Eppling, J.R. Cameron, R.H. Davis, A.S. Divatia
 A.I. Galonsky, E. Goldberg, R.W. Hill, Phys. Rev. 91, 438A (1953).

F^{18} Levels $N(\alpha,\alpha')F^{18}$ $E_\alpha = 1.5$ to 3.4
 $9\ 9$ 6.7
 6.8

N. P. Heydenburg, G.M. Tammer, Phys. Rev. 91, 439A (1953).

F^{19} Levels $O^{16}(p,\alpha)N^{15}$ pc
 $9\ 10$ $D,\alpha(\theta)$

Level	E_α	J
8.48	0.580	$1/2 \mp$ or $3/2 \mp$
8.56	0.640	$3/2 \mp$
~8.6	~0.7*	$1/2 \pm$
8.76	0.850	$1/2 \pm$

*Broad background of one or more levels

A.V. Cohen, Phil. Mag. 44, 583 (1953).

F^{21} τ 5^8 $F^{19}(\text{fast } t)$
 $9\ 12$ E.C. Campbell, J.E. Strain, ORNL-1496 (1952)

Ne^{20} Levels $O^{16}(\alpha,\alpha)O^{16}$ $E_\alpha = 0.94$ to 4.0 pc
 $10\ 10$ $\alpha,\alpha(\theta)$

Level	J	$\Gamma(\text{keV})$
6.74	$0+$	24
7.18	$3-$	10
7.22	$0+$	5

$10Ne^{20}$ Level J $\Gamma(\text{keV})$
 7.45 $2+$ 10
 7.85 $2+$ 3
 J.R. Cameron, Phys. Rev. 90, 839; 89, 909A (1953).

$F^{19}(p,\gamma)Ne^{20}$ EA
 Resonance 0.2244 ± 0.0004 $\Gamma = 0.001$
 Level 13.083 absolute measurement

S.E. Hunt, W.M. Jones, Phys. Rev. 89, 1283 (1953).

Na^{21} τ 27^8 $Na(\leq 70\text{-MeV}\gamma)$
 $11\ 10$ β^- 2.5 scin
 F.I. Boley, Iowa State Coll. J. Sci. 27, 129 (1953)

Levels $Ne(D,p')F^{19}$ $E_p = 0.2$ to 4.4 pc
 4.20 5.04 5.58
 4.31 5.50 6.48
 4.48 5.83

W. Haeblerli, A. Galonsky, E. Goldberg, R. Douglas, Phys. Rev. 91, 438A; 91, 439A (1953).

Na^{22} β^+ 100% 0.540 s
 $11\ 11$ 0.06% 1.83 D_2 fits spectral shape
 B.T. Wright, Phys. Rev. 90, 159 (1953).

Na^{23} Levels $Ne(D,p)F^{23}$ $E_p = 2.4$ to 3.6 pc
 $11\ 12$ 11.14 11.56
 11.36 11.87
 11.53

W. Haeblerli, A. Galonsky, E. Goldberg, R. Douglas, Phys. Rev. 91, 438A; 91, 439A (1953).

Na^{24} γ (1.38) $\tau < 2 \times 10^{-9}$ s $\beta\gamma$
 $11\ 13$ T.C. Engelder, Phys. Rev. 90, 259 (1953).

Capture γ $Na^{23}(n,\gamma)$ pair s
 2.753 ± 0.005

B.B. Kinsey, G.A. Bartholomew, Can. J. Phys. 31, 537 (1953).

Mg^{24} Level $Mg(n,n')F^{24}$ $E_n = 14$ scin
 $12\ 12$ γ 1.44 $n'\gamma$

R.E. Garrett, F.L. Hereford, B.W. Sloope, Phys. Rev. 91, 441A (1953); verbal report.

Mg^{25} Capture γ 's $Mg(n,\gamma)$ pair s
 $12\ 13$ 3.918
 3.5 \dagger 6.358

Assignment by agreement with d,p results
 \dagger Photons per 100 n captures in Mg
 Other lines not remeasured

B.B. Kinsey, G.A. Bartholomew, Can. J. Phys. 31, 901 (1953).

Mg^{26} Levels $Na^{23}(\alpha,\gamma)$ γ 's py scin
 $12\ 14$

Level	γ 's
1.83	1.83
2.97	1.14(6 \dagger) (2.97) (1 \dagger) 1.83(6 \dagger)

$^{26}_{12}\text{Mg}$	Level	γ 's		
	3.97	2.14	(3.97) (vw)	1.83
	4.35	1.38	1.14	1.83

Presence of 0.44 level in doubt

J.E. May, B.P. Foster, Phys. Rev. 90, 243; 90, 370A (1953).

$^{27}_{12}\text{Mg}$	Capture γ	$\text{Mg}(n,\gamma)$	pair s
12 15	13†	6.440	

Assignment by agreement with d,p results

†Photons per 100 n captures in Mg^{26}

Other lines not remeasured

B.B. Kinsey, G.A. Bartholomew, Can. J. Phys. 31, 901 (1953).

$^{28}_{12}\text{Mg}$	β^-	0.40	$\text{Mg}(39\text{-Mev } \alpha)$	a
12 16	γ	0.03	chem	scin
	30†	0.40		
	28†	0.95		
	71†	1.35		

R.K. Shellie, N.R. Johnson, Phys. Rev. 90, 325, (1953).

τ 20.8^h Si, K(420-Mev p)
 β^- 0.42 F-K plot linear chem; sl
 No other β ($\leq 10\%$)

L. Marquez, Phys. Rev. 90, 330 (1953).

τ 22.1^h Si(350-Mev p) a
 β^- 0.3 p 2.3^m Al chem; scin
 Several γ 's up to 2.6 Mev scin

J.W. Jones, T.P. Kohman, Phys. Rev. 90, 495 (1953).

τ 21.4^h Mg(56-Mev α)
 β^- 0.39 a
 γ 70† 0.032 $\alpha < 1$ scin
 †Photons per 100 Mg^{28} decays

A.H. Wapstra, A.L. Veendendaal, Phys. Rev. 91, 426 (1953).

$^{24}_{13}\text{Al}$	τ	2.10 ^s	$\text{Mg}(20\text{-Mev } p)$	
13 11	γ	2.9		scin
		4.3		
		5.3		
		7.1		

N.W. Glass, L.K. Jensen, J.R. Richardson, Phys. Rev. 90, 320 (1953).

$^{25}_{13}\text{Al}$	Resonance	$\text{Mg}^{24}(p,\gamma)\text{Al}^{25}$	EA
13 12		0.4180 \pm 0.0005 $\Gamma = 0.0040$	
		absolute measurement	
		S.E. Hunt, W.M. Jones, Phys. Rev. 89, 1283 (1953).	

$^{27}_{13}\text{Al}$	Q	+0.149	I
13 14			

H. Lew, G. Wessel, Phys. Rev. 90, 1 (1953).

$^{27}_{13}\text{Al}$	Levels	$\text{Al}(n,\gamma)$	$E_n = 14$	scin
	γ	0.81?		n' γ
		1.03		
		2.34		

R.E. Garrett, F.L. Hereford, B.W. Sloope, Phys. Rev. 91, 441A (1953); verbal report.

Resonances	$\text{Mg}^{26}(p,\gamma)\text{Al}^{27}$	EA
E_0	Γ	
0.3148 \pm 0.0005	0.004	
0.3385 \pm 0.0005	0.002	
0.3894 \pm 0.0005	0.004	
0.4365 \pm 0.0004	0.004	
0.4542 \pm 0.0003	< 0.001	
(Al^{27}) 0.484 \pm 0.0010	0.010	
	absolute measurement	

*Assignment from Tangen who found no β^+

S.E. Hunt, W.M. Jones, Phys. Rev. 89, 1283 (1953).

$^{28}_{13}\text{Al}$	τ	2.27 ^m \pm 0.02	$\text{Al}(\text{pile } n)$
13 15			

Counted 5 samples each for 5 half-lives

R.M. Bartholomew, F. Brown, W.D. Howell, W.R.J. Shorey, L. Yaffe, Can. J. Phys. 31, 714 (1953).

β^- 2.85 d 21^h Mg chem; sl
 F-K plot linear

L. Marquez, Phys. Rev. 90, 330 (1953).

γ 1.78 d 21^h Mg scin

R.K. Shellie, N.R. Johnson, Phys. Rev. 90, 325 (1953).

Si	Relative abundances			SiF_4 ; ms
	A	28	29	30
	%	92.18	4.71	3.12

J.H. Reynolds, Phys. Rev. 90, 1047 (1953).

$^{27}_{14}\text{Si}$	τ	4.45 ^s	$\text{Si}(\leq 25\text{-Mev } \gamma)$
14 13			

R.G. Summers-Gill, R.N. Haslam, L. Katz, Can. J. Phys. 31, 70 (1953).

$^{28}_{14}\text{Si}$	Resonances	$\text{Al}^{27}(p,\gamma)\text{Si}^{28}$	EA
14 14			
	E_0	Γ	
	0.226 \pm 0.0015	~ 0.001	
	0.294 \pm 0.0005	< 0.001	
	0.3256 \pm 0.0004	< 0.001	
	0.4047 \pm 0.0004	0.0007	
	0.4385 \pm 0.0005	< 0.001	
	0.5040 \pm 0.0006	0.0007	
		absolute measurements	

S.E. Hunt, W.M. Jones, Phys. Rev. 89, 1283 (1953).

$^{29}_{14}\text{Si}$	Levels	$^{29}\text{Si}(d,p)$	$E_d = 8.21$	a pc
14 15	d, p(θ)	Level	i_n	$d\sigma/d\Omega$
		E, s	0	62
		(1.278)	2	6.2
		(2.027)	2	2.4
		(2.426)	*	0.7

$^{29}_{15}\text{Si}$	Level	I_n	$d\sigma/d\Omega^\dagger$
	(3.070)	2	1.2
	(3.823)	3	4.0
	(4.934)	1	55
	(6.380)	1	32

\dagger mb/sterad at maximum of angular distribution
*angular distribution isotropic

J.R.Holt, T.H.Marsham, Proc. Phys. Soc. 66A, 467 (1953); Phys. Rev. 89, 665 (1953).

$^{297}_{14}\text{Si}$	Resonances	Mg(α, n)Si	$E_\alpha = 5.3$	a
		4.6		
		4.8		

Excitation function given

J.Nagy, Acta Physica Acad. Sci. Hung. 3, 15 (1953).

$^{30}_{14}\text{Si}$	Levels	Si(d, p)	$E_d = 8.21$	a	pc
	d, p(θ)	(5.07) $I_n=0$			
		(5.50) $I_n=0$ or 2			

J.R.Holt, T.N.Marsham, Proc. Phys. Soc. 66A, 467 (1953).

$^{317}_{14}\text{Si}$	Levels	Si(d, p)	$E_d = 8.21$	a	pc
	d, p(θ)	(0.757) $I_n=0$			
		(1.899) $I_n=0$ or 2			

J.R.Holt, T.N.Marsham, Proc. Phys. Soc. 66A, 467 (1953).

$^{32}_{14}\text{Si}$	Abundance $< 4 \times 10^{-6}\%$ of natural silicon
	No P^{33} β 's observed, $\text{Si}^{32}(n, \gamma) \text{Si}^{33} \rightarrow P^{33}$
	Assumed $\sigma(n, \gamma) = 0.05$

A.Turkevich, A.Tompkins, Phys. Rev. 90, 247 (1953).

$^{28}_{15}\text{P}$	τ	0.28 ^s	Si(20-Mev p)	scin
	β^+			
	γ	7		
	No α ($< 10\%$ of γ)			

N.W.Glass, L.K.Jensen, J.R.Richardson, Phys. Rev. 90, 320 (1953).

$^{29}_{15}\text{P}$	β^+	3.9	Si(6-Mev d)scin
	M.Nahmias, T.Yuasa, Compt. rend. 236, 2399 (1953).		

$^{32}_{15}\text{P}$	e^+/e^- ($H_p = 1600$)	$< 10^{-5}$	s
	G.W.McClure, Phys. Rev. 91, 483A (1953).		

$^{32}_{16}\text{S}$	Level	S(n, n' γ)	$E_n = 14$	scin
	γ	2.32		n' γ

R.E.Garrett, F.L.Herford, B.W.Sloope, Phys. Rev. 91, 441A (1953); verbal report.

$^{33}_{16}\text{S}$	Levels	$S^{32}(d, p)$	$E_d = 8.18$	a	pc
	d, p(θ)	Level	I_n	$d\sigma/d\Omega^\dagger$	
		g.s.	2	7.1	
		0.85	0	39	
		1.86	*	0.8	
		2.28	*	1.3	
		2.90	3	14	
		3.26	1	83	

$^{33}_{17}\text{S}$	Level	I_n	$d\sigma/d\Omega^\dagger$
	3.91	—	1.5
	4.21	1	15
	4.89	1	9.4
	5.72	1	100
	6.48**	1and2	41
	7.44		
	7.83		

\dagger Relative at maximum of angular distribution
* Angular distribution isotropic
** Level is a doublet

J.R.Holt, T.N.Marsham, Proc. Phys. Soc. 66A, 467 (1953); Phys. Rev. 89, 665 (1953).

Level	$A^{36}(n, \alpha)$	$E_n = 2.15$ to 4.40
	1.1 ± 0.2	pc

B.J.Toppel, S.D.Bloom, Phys. Rev. 91, 473A (1953).

$^{32}_{17}\text{Cl}$	τ	0.306 ^s	S(20-Mev p)
	β^+		scin
	γ	4.8	
	No α ($< 10\%$ of γ)		

N.W.Glass, L.K.Jensen, J.R.Richardson, Phys. Rev. 90, 320 (1953).

$^{33}_{17}\text{Cl}$	β^+	4.2	S(6-Mev d)
			scin
	M.Nahmias, T.Yuasa, Compt. rend. 236, 2399 (1953).		

Resonances	$S^{32}(d, p)S^{32}$	$E_p = 1.0$ to 2.8
d, p(θ)	1.90 $J=3/2^-$	$\Gamma < 0.025$
	2.31 $J=1/2^-$	$\Gamma \sim 0.06$

A.J.Ferguson, M.E.Gove, Phys. Rev. 91, 439A (1953).

$^{34}_{17}\text{Cl}$	γ	(0.145) $\alpha = 0.13$	M3
	W.Arber, P.Stähelin, Helv. Phys. Acta 26, 433 (1953)		

$^{35}_{17}\text{Cl}$	τ	1.45 ^s	Cl(γ, n)
	W.Arber, P.Stähelin, Helv. Phys. Acta 26, 433 (1953)		

$^{36}_{17}\text{Cl}$	Capture γ 's	Cl(n, γ)	2 cryst scin s
	35 \dagger 0.70	14 \dagger	2.40
	29 \dagger 1.12	10 \dagger	2.68
	19 \dagger 1.77	23 \dagger	3.71
		2.03	4.67

W.A.Reardon, R.W.Krone, R.Stump, Phys. Rev. 91, 334; 91, 442A (1953).

A	Neutron resonances (Mev)	$E_n = 0.4$ to 1.1
	E_{0-}	σ_{0-}
	0.58	~ 3.5
	0.60	~ 3.5
	0.74	~ 3.5

J.B.Guernsey, C.Goodman, Phys. Rev. 91, 440A (1953); verbal report.

A ³⁷ 18 19	τ	32 ^d	A ³⁶ (pile n)	
	E _{d1a}	0.815	scin a	
			continuous γ endpoint	
			C.E.Anderson, G.W.Wheeler, W.W.Watson, Phys. Rev. 90, 606 (1953).	
A ³⁸ 18 20			A ³⁶ /A ³⁸ variation of >300% for various pitchblende ores suggests A ³⁸ formation by α 's or fission n's	
			W.H.Fleming, H.G.Thode, Phys. Rev. 90, 857 (1953).	
A ⁴¹ 18 23	γ	(1.8)	$\tau = 6.6 \times 10^{-9}$ s	by
			T.C.Engelder, Phys. Rev. 90, 259 (1953).	
Ca ³⁹ 20 19	τ	1.00 ^s	Ca (\leq 25-Mev γ)	
			R.G.Summers-Gill, R.N.H.Hasslam, L. Katz, Can. J. Phys. 31, 70 (1953).	
	τ	1.00 ^s	Ca (\leq 30-Mev γ)	
	β^+	6.7	a	
			R.Braams, C.L.Smith, Phys. Rev. 90, 995 (1953).	
Ca ⁴⁰ 20 20	Levels	Ca(d,p')	E _p = 6.02 to 8.15	s
		3.35 3.90		
		3.71 4.49		
			C.M.Braams, C.K.Bockelman, C.P.Browne, W.W. Buechner, Phys. Rev. 91, 474A (1953); verbal report.	
Ca ⁴¹ 20 21	Levels	Ca(d,d)	E _d = 8.13	ppl
	d, p (θ)	Level 1 _n	$d\sigma/d\Omega$	
		g.s. 3	3.8	
		1.90 1	23	
		2.42 1	10	
		2.9		
		3.6		
		3.96 2 or 1	8	
		4.76 2	7.2	
		5.72 2	7.8	
			mb/sterad at maximum of angular distribution	
			J.R.Holt, T.W.Marshall, Proc. Phys. Soc. 66A, 565 (1953).	
Ca ⁴³ 20 23	I	7/2	I	
	μ	-1.3157		
			C.D.Jeffries, Phys. Rev. 90, 1130 (1953).	
Ca ⁴⁷ 20 27	τ	4.8 ^d	p 3.4 ^d Sc Ca(th n)	
			ion chem	
			L.G.Cook, K.D.Shafer, Phys. Rev. 90, 1121 (1953).	
Sc ⁴³ 21 22	τ	3.95 ^h	Ca(7-Mev p) chem	
			J.E.Duval, M.H.Kurbatov, J. Am. Chem. Soc. 75, 2246 (1953).	
Sc ⁴⁶ 21 25	β^-	0.22% 1.25	F-K plot not linear	s
			F.H.Schmidt, G.L.Kelster, Phys. Rev. 91, 483A (1953).	
			No delayed $\gamma\gamma$ ($\tau < 1.5 \times 10^{-9}$ s)	
			C.E.Whittle, F.T.Porter, Phys. Rev. 90, 498 (1953).	

Sc ⁴⁷ 21 26	β^-	~68% 0.435	Ti ⁴⁹ (10-Mev d)	
	γ	~34% 0.622	sl	
		0.185	scin	
		(0.445) (γ)	No (0.625) (γ)	
			L.S.Cheng, M.L.Pool, Phys. Rev. 90, 886 (1953).	
Sc ⁴⁸ 21 27	τ	3.44 ^d	Ca(7-Mev p) chem	
			J.E.Duval, M.H.Kurbatov, J. Am. Chem. Soc. 75, 2246 (1953).	
	γ	100 [†] (0.98)	scin	
		100 [†] 1.05		
		100 [†] (1.33)		
			From comparison with γ^{48} No 2.2 γ	
			M.J.Sterk, A.H.Wapstra, R.E.W.Kropveld, Physica 19, 135 (1953).	
γ^{48} 23 25	τ	16.4 ^d		
		(1.32 γ) (0.99 γ) (θ)	I = 4, 2, 0	
			F.Meyer, S.Schlieder, Z. Phys. 135, 119 (1953).	
	γ	0.98	scin	
		1.33		
		2.22 \pm 0.10		
		$\epsilon/\beta^+ = 0.48$		
			M.J.Sterk, A.H.Wapstra, R.E.W.Kropveld, Physica 19, 135 (1953).	
	γ	(0.99) $\tau < 2 \times 10^{-9}$ s	by	
		(1.32) $\tau < 2 \times 10^{-9}$ s	by	
			T.C.Engelder, Phys. Rev. 90, 259 (1953).	
Cr ⁴⁹ 24 25	τ	41.7 ^m	Ti(40-Mev α)	
	β^+	15 [†] 0.73	chem	sl
		35 [†] 1.39		
		50 [†] 1.54		
	γ	0.153 $\alpha_K = 0.02$ M1	ce; pe-	
		0.609 $\alpha_K = < 4 \times 10^{-4}$	pe-	
		No 0.782 γ		
			B.Crasemann, H.T.Easterday, Phys. Rev. 90, 1124 (1953).	
Cr ⁵³ 24 29	μ	-0.47351	I	
	$\nu(\text{Cr}^{53})/\nu(\text{N}^{14})$	= 0.78226 \pm 0.00005	Na ₂ CrO ₄	
			F.Alder, K.Haibach, Helv. Phys. Acta 26, 426 (1953).	
Mn ⁵⁶ 25 31	τ	2.58 ^h \pm 0.003	Mn(pile n)	
			Counted 2 samples each for 10 half-lives	
			R.M.Bartholomew, F.Brown, W.D.Howell, W.R.J. Shorey, L. Yaffe, Can. J. Phys. 31, 714 (1953).	
	γ	(0.85) $\tau < 2 \times 10^{-9}$ s	by	
			T.C.Engelder, Phys. Rev. 90, 259 (1953).	
Fe 26 31	γ 's	Fe(n,n' γ)	E _n = 14	scin
		0.85	n' γ	
		1.29		
		1.42		
		2.1		
			R.E.Garrett, F.L.Herford, S.W.Sloope, Phys. Rev. 91, 441A (1953); verbal report.	
Fe ⁵⁷ 26 31	μ	< 0.05	para	
			R.S.Trenam, Proc. Phys. Soc. 66A, 414 (1953).	

^{59}Fe $\gamma\gamma$ (θ) scin
26 33 Agrees with $I = 3/2, 5/2, 7/2$
Excludes $I = 5/2, 3/2, 7/2$

D. Schliff, F. H. Metzger, Phys. Rev. 90, 849 (1953).

^{60}Co τ $10.47^m \pm 0.02$ Co(pile n)
27 33 Counted 6 samples each for 7 half-lives
10.7^m R. M. Bartholomew, F. Brown, W. D. Howell, W. R. J. Shorey
L. Yaffe, Can. J. Phys. 31, 714 (1953).

5.2^y $\gamma\gamma$ (θ) $I=4, 2, 0$ $b=0.167$

J. S. Lawson, Jr., H. Frauenfelder, W. K. Jentschke,
Phys. Rev. 91, 484A; 91, 649 (1953).

$\gamma\gamma$ (θ) $I=4, 2, 0$ $b=0.166$

S. Chatterjee, A. K. Saha, Z. Phys. 135, 141 (1953).

γ (1.17) $\tau < 2 \times 10^{-9}$ s $\beta\gamma$
(1.33) $\tau < 2 \times 10^{-9}$ s $\beta\gamma$
T. C. Engelder, Phys. Rev. 90, 259 (1953).

^{60}Co Capture γ 's Co(n, γ) 2 cryst scin s
27 33 100† 0.52
18† 1.30
20† 2.00
2.39†
18† 3.58

W. A. Reardon, R. W. Krone, R. Stump, Phys. Rev. 91,
334; 91, 442A (1953).

Cu γ 's Cu(n,n' γ) $E_n=14$ scin
n' γ
1.1
1.55
2.14

R. E. Garrett, F. L. Hereford, B. W. Sloope, Phys. Rev.
91, 441A (1953); verbal report.

^{61}Cu γ (0.65) $\tau < 2 \times 10^{-9}$ s $\beta\gamma$
29 32 T. C. Engelder, Phys. Rev. 90, 259 (1953).

^{63}Cu q -0.16 para
29 34 B. Bleaney, K. D. Bowers, R. S. Trenam, Proc. Phys.
Soc. 66A, 410 (1953).

^{65}Cu q -0.15 para
29 36 B. Bleaney, K. D. Bowers, R. S. Trenam, Proc. Phys.
Soc. 66A, 410 (1953).

^{66}Cu τ $5.07^m \pm 0.02$ Cu(pile n)
29 37 Counted for 9 half-lives β electroscopie

R. M. Bartholomew, F. Brown, W. D. Howell, W. R. J. Shorey,
L. Yaffe, Can. J. Phys. 31, 714 (1953).

γ (1.04) $\tau < 2 \times 10^{-9}$ s $\beta\gamma$

T. C. Engelder, Phys. Rev. 90, 259 (1953).

^{67}Cu τ 61^h Ni(40-Mev α)
29 38 β^- 45% 0.395 Zn(195-Mev d) chem; sl

^{67}Cu 35% 0.484
29 38 20% 0.577
 γ 0.092 $\alpha = 0.5$ E2
0.182 $\alpha = 0.012$ M1

H. T. Easterday, Phys. Rev. 91, 653 (1953).

β^- 0.37 Zn(27-Mev d) $\beta\gamma$
0.45 $\beta\gamma$
 $\sim 55\%$ 0.55 a
 γ st 0.094 scin
st 0.19
W 0.30
W 0.39
(0.37 β) (0.19 γ) (0.45 β) (0.09 γ)

R. H. Nussbaum, A. H. Wapstra, M. F. Verster, Physica,
19, 131 (1953).

^{68}Cu τ 32^s Zn(≤ 15 -Mev n) chem; a
29 39 β^- ~ 3.0 Ga(≤ 15 -Mev n)
 γ weak

A. Flammersfeld, Z. Naturf. 8a, 274 (1953).

^{64}Zn τ_{ee} $> 8 \times 10^{15}$ y pc
30 34 A. Berthelot, R. Chaminade, C. Levi, L. Papineau,
Compt. rend. 236, 1769 (1953).

^{65}Zn β^+ 0.327 sl
30 35 γ (1.11) $\alpha = 1.8 \times 10^{-4}$
 $\gamma/\beta^+ = 28 \pm 6$ Na²² comparison and ce γ/β^+
No 0.20 γ ($< 3 \times 10^{-4}$) sl pe $^-$
M. Sakai, P. Hubert, Compt. rend. 236, 1249 (1953).

γ (1.11) $\alpha = 2.5 \times 10^{-4}$ sl ce $^-$, Cpt

E. F. Sturcken, A. H. Weber, Phys. Rev. 91, 484A
(1953).

$\gamma/\beta^+ = 31 \pm 5$ Na²² comparison
No 0.20 γ ($< 0.1\%$) scin

N. Perrin, J. Phys. Radium 14, 273 (1953).

$\epsilon_K/\beta^+ = 33 \pm 3$ pc
P. Avignon, Compt. rend. 237, 157 (1953).

^{64}Ga τ 2.5^m Zn⁶⁴ (8.1-Mev p)
31 33 β^+ ~ 5 chem scin
 γ 0.97
2.2?
3.8

$E_{d1s} = 7.2 \pm 0.5$ from (p,n) threshold

B. L. Cohen, Phys. Rev. 91, 74 (1953).

τ 2.6^m Zn⁶⁴ (9.6-Mev p)
 β^+ Zn(19-Mev d) Cu(40-Mev α) chem

B. Crasemann, Phys. Rev. 90, 995 (1953).

^{65}Ga β^+ 90% 2.1 Zn(19-Mev d) Cu(40-Mev α)
31 34 10% 2.52 chem; sl

B. Crasemann, Phys. Rev. 90, 995 (1953).

Ga ⁶⁷ 31 36	ϵ γ	Zn(p) ion chem		
		α_K	K/L	
	2.7%	0.090	0.074	M1
	63.9%	0.092	0.63	E2
	29.6%	0.182	0.011	M1
	1 %	0.206	0.029	~14
	20.2%	0.296	0.0029	7.6 M1
	4.9%	0.388	0.0019	M1
	0.4%	0.496		
	0.2%	0.790		sl ce ⁻ pe ⁻ , scin
	0.4%	0.880		

(0.206 γ) (0.090 γ , 0.182 γ) (all γ 's) (χ)

(0.496 γ) (0.296 γ , 0.388 γ)

(0.090 γ , 0.296 γ) (0.092 γ) delay of 8.5 μ s

No other delay (<5x10⁻⁷s)

Decay scheme, spins proposed

B.H.Ketelle, A.R.Brosi, F.W.Porter, Phys. Rev. 90, 567 (1953).

Ge	Relative abundances					GeF ₄ ; ms
A	70	72	73	74	76	
	20.52	27.43	7.76	36.54	7.76	

J.H.Reynolds, Phys. Rev. 90, 1047 (1953).

As ⁷¹ 33 38	τ β^+ γ	60 ^h W ~0.307 0.82 0.0233 0.175	Ge (25-Mev d) ms chem s ce ⁻

H.Atterling, S.Thulin, Nature 171, 927 (1953).

τ β^+ γ	60 ^h 0.80 0.175	K/LM = 8.3	Ge (14-Mev d) chem sn/2

ce_K⁻/ β^+ = 0.14

P.H.Stoker, O.P.Hok, Physica 19, 279 (1953).

As ⁷² 33 39	γ ce _K ⁻ / β^+ = 0.0090	0.697	Ge (14-Mev d) chem sn/2 ce ⁻

P.H.Stoker, O.P.Hok, Physica 19, 279 (1953).

As ⁷³ 33 40	γ	0.0130 0.053	K/LM = 5.2	Ge (14-Mev d) chem; ce ⁻

P.H.Stoker, O.P.Hok, Physica 19, 279 (1953).

γ	0.0135 0.054	α = large 900 μ s < τ < 10 ³	τ = 4.6 μ s scin

0.0135 γ follows 0.054 γ

J.P.Welker, A.W.Schardt, J.J.Howland, Jr., G.Friedlander, Phys. Rev. 91, 484A (1953).

As ⁷⁵ 33 42	No isomeric state observed after 5 min. Separation of As from Se ⁷⁵
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E.H.Jensen, L.J.Laslett, D.S.Martin, Jr., F.J. Hughes, W.W.Pratt, Phys. Rev. 90, 557 (1953).

As ⁷⁶ 33 43	(~2 β) (~0.6 γ) (θ) b = 0.076 sl
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H.Rose, Phil. Mag. 44, 739 (1953).

Se ⁷⁵ 34 41	ϵ (no β 's) γ	0.5% 14% 6.5% ~3% 24% 0.04% 71% ~5% 0.03% 14%	0.067 0.077 0.098 0.124 0.138 0.203 0.269 0.281 0.308 0.405	Se (pile n) sl ce ⁻ pe ⁻

$\alpha_K \sim 8$ K/L=11

$\alpha_K \sim 0.3$

$\alpha_K = 0.12$

$\alpha_K = 0.09$

$\alpha_K = 0.0015$

No 0.0247 γ No delayed $\gamma\gamma$ (0.3 μ s-10 μ s)
(<0.15 γ) (γ) Decay scheme proposed

E.H.Jensen, L.J.Laslett, D.S.Martin, Jr., F.J. Hughes, W.W.Pratt, Phys. Rev. 90, 557 (1953).

Se ⁷⁷ 34 43	μ ν (Se ⁷⁷) / ν (D) = 1.24211 ± 0.00010	0.53262	H ₂ Se Mic
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H.E.Walchli, Phys. Rev. 90, 331 (1953).

Se ⁸² 34 48	τ No 36 ^h Br detected	>10 ¹⁷ y	Se chem
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H.D.Sharma, Curr. Sci. 22, 45 (1953).

Br ⁸⁰ 35 45	No γ ($\gamma/\beta^+ \leq 1.25$)		
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J.Laberrloue-Frolow, R. Bernas, H.Langevin, Compt. rend. 236, 1246 (1953).

Kr ⁸⁵ 36 49	τ From decrease in abundance in seven years	10.27 ^y	U(n,f) chem ms
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R.K.Wanless, H.G.Thode, Can. J. Phys. 31, 517 (1953).

Sr ⁸⁹ 38 51	Levels	Sr(d,p)	E _d = 8.01	ppl
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1.07 4.73

2.09 5.46

2.66

J.R.Holt, T.N.Marsham, Proc. Phys. Soc. 66A, 565 (1953).

Sr ⁹¹ 38 53	τ β^- γ	9.67 ^h 7% 33% 29% 4% 27% 20.5 \pm 5.2 \pm 9.2 \pm 1.1 \pm 10.4 \pm 1.8 \pm	U(n,f) chem sl
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0.61

1.09

1.36

2.03

2.67

0.552

0.645

0.748

0.93

1.025

1.413

(γ) (0.65 γ) (γ) (0.93 γ) (γ) (1.41 γ)

D.R.Ames, M.E.Bunker, L.W.Langer, B.W.Sorenson, Phys. Rev. 89, 903A; 91, 68 (1953).

Y ⁸⁸ 39 49	(0.908 γ) (1.85 γ) (θ) γ	I=3,2,0 (0.908) (E)1 (M)2 <0.001%
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J.Varma, B.L.Saraf, W.B.Todd, Jr., Phys. Rev. 91, 484A (1953).

(0.908 γ) (1.85 γ) (θ) I=3,2,0
 γ (0.908) (E)1 (M)2 0.002-0.015%

R.M.Steffen, Phys. Rev. 90, 321 (1953).

γ^{91} τ 50.3^m d 9.7^h Sr chem
39 52 γ 0.551 $\alpha_K = 0.046$ π ce⁻
51^m K/L = 6.0 M4

No β^- (< 1.6% of IT)

D.P. Ames, W.E. Bunker, L.M. Langer, B.M. Sorenson, Phys. Rev. 89, 903A; 91 68 (1953).

Zr⁹⁵ τ 65^d Zr⁹⁴ (pile n, γ)
40 55 β^- ~49% ~0.360 π 2
~49% ~0.400
~2% ~0.910
 γ 0.235 K/L = 4.5 π ce⁻
0.725 K/L = 5
0.758

J.M. Cork, J.M. LeBlanc, D.W. Martin, W.H. Nestor, M.K. Brice, Phys. Rev. 90, 579 (1953).

Zr⁹⁶ $T_{1/2}$ 6x10¹⁶y 89.5% Zr⁹⁶ scin
40 56 β or γ of 3.8±0.5

J.A. McCarthy, Phys. Rev. 90, 853 (1953).

Nb⁹⁵ γ 0.235 K/L = 4.5 π ce⁻
41 54 J.M. Cork, J.M. LeBlanc, D.W. Martin, W.H. Nestor
90^h M.K. Brice, Phys. Rev. 90, 579 (1953).

35^d T_2 35.0^d d 65^d Zr; chem
 β^- 0.165 π 2
 γ 0.753 π ce⁻
0.768 K/L = 7.6

Evidence for low energy γ

J.M. Cork, J.M. LeBlanc, D.W. Martin, W.H. Nestor, M.K. Brice, Phys. Rev. 90, 579 (1953).

Mo⁹³ γ α_K^* K/L π ce⁻
42 51 0.262 0.53 3.09 E4
6.7^h 0.684 1.5x10⁻³ 8 M1
1.479 2.4x10⁻⁴ E2, M1

Mo x rays crit a, cryst

*Based on α (0.282 γ) = 0.7

C.W. Forsthooff, R.H. Goeckermann, R.A. Naumann, Phys. Rev. 90, 1004 (1953).

Tc⁹⁹ τ (metal) 6.04^h ic
43 56 τ dependent on chemical state
5.9^h K.T. Bainbridge, M. Goldhaber, E. Wilson, Phys. Rev. 90, 430 (1953).

Rh Neutron resonance (ev) cryst s
1.260±0.004 $\sigma_0 = 5000 \pm 200$
 $\Gamma = 0.156 \pm 0.005$

V.L. Sailor, Phys. Rev. 91, 53; 90, 363A (1953).

Rh¹⁰⁴ γ 14⁺ 0.0511 K/L > 5 π ce⁻
45 59 170⁺ 0.0772 K/L ~0.6 scin
4.3^m (0.051 γ) γ γ Rh (pile n)
†Relative intensity ce⁻

W.C. Jordan, J.M. Cork, S.B. Burson, Phys. Rev. 90, 862 (1953).

Rh¹⁰⁴ γ 0.55 Rh (pile n); scin
45 59 w ~1.2

No (0.55 γ) (γ) No (0.55 γ) (γ)

W.C. Jordan, J.M. Cork, S.B. Burson, Phys. Rev. 90, 862 (1953).

Pd¹⁰⁹ T_2 13.6^h Pd (pile n); chem
46 63 Counted for 15 half-lives G-M counter
13^h

W.W. Meinke, Phys. Rev. 90, 410 (1953).

Pd¹¹² γ 0.018 U (28-Mev d) scin
46 66 chem
R. Nussbaum, R.H. Wapstra, A.H. Verster, N.F. Cerfontain, H. Cerfontain, Physica 19, 385 (1953).

Ag¹⁰⁶ No β^+ (<1% of ϵ) scin
47 59 W.L. Bendel, F.J. Shore, H.N. Brown, R.A. Becker,
8.6^d Phys. Rev. 90, 88 (1953).

24.5^m T_2 24.0^m Ag (28-Mev γ)
 β^+ 17% 1.45 π 2
83% 1.96
 β^- (?) <1% 0.36
 γ 17% 0.512 $\alpha_K \sim 3 \times 10^{-3}$ scin, ce⁻
 $\epsilon_K / (0.512 \gamma + \text{annihil } \gamma's) = 0.28$
High energy photons probably bremsstrahlung

W.L. Bendel, F.J. Shore, H.N. Brown, R.A. Becker, Phys. Rev. 90, 888 (1953).

Ag¹⁰⁹ γ (0.087) $\alpha_K \sim 0$ d 13^h Pd scin
47 62
39^a R. Nussbaum, R.H. Wapstra, A.H. Verster, N.F. Cerfontain, H. Cerfontain, Physica 19, 385 (1953).

Ag¹¹² β^- 15% ~1 U (28-Mev d) a
47 65 20% 2.7 chem $\alpha\beta\gamma$
40% 3.5
25% 4.1
 γ 0.62 scin
No (4.1 β) (γ)

R. Nussbaum, R.H. Wapstra, A.H. Verster, N.F. Cerfontain, H. Cerfontain, Physica 19, 385 (1953).

Cd Neutron resonance (ev)
0.180 $\sigma_0 = 7800$ $\Gamma = 0.113$
B.N. Brockhouse, Can. J. Phys. 31, 432 (1953).

Neutron resonances (ev) $E_n = 1$ to 4000 ev

18.0
st 27.2 Cd¹¹¹ $\sigma_0 \Gamma^2 = 35$
66.6 Cd^{112?}
st 88.2 Cd^{110?}
122 Cd^{116?}
163
234
400
540

R.R. Palmer, L.M. Bollinger, Phys. Rev. 91, 450A (1953); verbal report.

Cd^{114}	Capture γ 's	$\text{Cd}(n,\gamma)$	2 cryst scin s
48 66	33†	0.88	
	13†	1.33	
	38†	1.61	
	26†	2.44	
	34†	3.61	
		4.67	
		5.17	

W.A.Reardon, R.W.Krone, R. Stump, Phys. Rev. 91, 442A; 334 (1953).

In	Neutron resonance (ev)
	1.458 $\sigma_0=27,000$ $\Gamma=0.114$
	$\sigma_{s0}=1,600$ $\Gamma_n/\Gamma=0.045$

L.B.Borst, Phys. Rev. 90, 859 (1953).

In^{110}	τ_i	4.9 ^h	Ag(20-Mev α)
49 61	γ IT 195*	0.121	K/LM=4.5 chem; sl ce ⁻
4.9 ^h	100*	0.657	
	42*	0.884	
	27*	0.937	

* Relative intensity of ce⁻

E.Bleuler, J.W.Blue, S.A.Chowdary, A.C.Johnson, D.J.Tendam, Phys. Rev. 90, 464 (1953).

69^m	β^+	2.25	Ag(20-Mev α) sl
	γ	0.656	chem sl ce ⁻
	(2.25 β) (γ)	No 2.9 β^+ (<3%)	a/ $\beta\gamma$

E.Bleuler, J.W.Blue, S.A.Chowdary, A.C.Johnson, D.J.Tendam, Phys. Rev. 90, 464 (1953).

In^{112}	τ_1	20.7 ^m	Ag(20-Mev α) chem
49 63	γ	0.155	α large K/LM = 3.7 $\beta\gamma$

E. Bleuler, J.W.Blue, S.A.Chowdary, A.C.Johnson, D.J.Tendam, Phys. Rev. 90, 464 (1953).

9^m	τ_2	14.5 ^m	d 21 ^m In Ag(20-Mev α)
	β^-	44%	0.656 s
	$\beta^+(\epsilon)$	56%	1.52
	No $\beta\gamma$		

E.Bleuler, J.W.Blue, S.A.Chowdary, A.C.Johnson, D.J.Tendam, Phys. Rev. 90, 464 (1953).

In^{114}	(β) (possible 1.2 γ)	<0.3% of β 's	a/ $\beta\gamma$
49 65	R.H.Nussbaum, R.Van Lieshout, Physica 19, 451.		
72 ^s	(1953).		

Sn^{124}	$\tau_{\beta\beta}$	>1.5 $\times 10^{17}$ y	95% Sn ¹²⁴ scin
50 74	J.A.McCarthy, Phys. Rev. 90, 853 (1953).		

Te^{130}	>10 ¹⁷ y	Te chem
52 78	H.D.Sharma, Curr. Sci. 22, 45 (1953).	

127	Level	I(n,n' γ)	$E_n=14$ scin
53 74	γ 's	0.7-0.8	n' γ
	No other γ 's observed		

R.E.Garrett, F.L.Herford, B.W.Sloope, Phys.Rev. 91, 441A (1953); verbal report.

128	γ	100†	0.455	scin
53 75		2†	0.98	

A.H.Wapstra, N.F.Verster, M.Boelhouwer, Physica 19, 138 (1953).

129	$q(I^{129})/q(I^{127})=0.701213$	SnI ₄ ; quad res
53 76	± 0.000015	
	R.Livingston, H.Zeldes, Phys. Rev. 90, 609 (1953).	

β^-	0.150	$\Delta I=2$, no s
γ	0.038	$\alpha_K=19$ M1
No 0.188 β (<1%)		scin

E.der Mateosian, C.S.Wu, Phys. Rev. 91, 497A, (1953); verbal report.

131	τ	8.07 ^d ± 0.02	electroscope
53 78	Counted 3 samples for ~ 6 half-lives		

H.H.Seiliger, L. Cavallo, S.V.Culpepper, Phys. Rev. 90, 443 (1953).

No (0.638 γ) (0.080 γ)	a/ $\gamma\gamma$
(0.284 γ) (0.080 γ) (θ) isotropic	scin
D.Schliff, F.R.Metzger, Phys. Rev. 90, 849 (1953).	

Cs^{127}	γ	0.125	I(56-Mev α)
55 72		0.41	scin

A.H.Wapstra, N.F.Verster, M.Boelhouwer, Physica 19, 138 (1953).

Cs^{128}	τ	3.5 ^m	d 2.4 ^d Ba
55 73	β^+	1.1 ± 0.7	chem a/ $\beta\gamma$
		3.1	s
	γ	100†	0.135
			0.29
		30†	0.455
		w	0.97

($\sim 1.1\beta$) (γ) $\gamma\gamma$ No (3.1 β) (γ) γ 's could belong to Ba¹²⁸

R.W.Fink, E.O.Wilg, Phys. Rev. 91, 194 (1953).

τ	3.9 ^m	I(56-Mev α)
γ	~ 0.46	scin
	1.5	

(K x ray)/ $\beta^+ = 0.4$

A.H.Wapstra, N.F.Verster, M.Boelhouwer, Physica 19, 138 (1953).

Cs^{129}	γ	95†	0.385	I(56-Mev α)
55 74		5†	0.560	scin
	0.040 γ not observed			

A.H.Wapstra, N.F.Verster, M.Boelhouwer, Physica 19, 138 (1953).

Cs^{132}	γ	0.69	Cs(28-Mev d)
55 77			scin

A.H.Wapstra, N.F.Verster, M.Boelhouwer, Physica 19, 138 (1953).

Cs^{134}	β^-	10%	~ 0.08	Cs(pile n)
55 79		3%	~ 0.21	sn/2
2.3 ^y		6%	0.410	
		81%	0.657	

55	Cs ¹³⁴ ₇₉	γ		<u>K/L</u>		<u>K/L</u>	
			0.202*		0.797	7.3	
23	y		0.475	~5	0.803*		
			0.563	~10	1.039	~10	
			0.570*		1.168	~10	
			0.605	8.4	1.368	~10	
			0.663*				s ce ⁻ , pe ⁻
			* ce ⁻ only observed				
			J.M.Cork, J.M.LeBlanc, W.H.Nester, M.K.Brice, Phys. Rev. 89, 907A; 90, 444 (1953).				
56	Ba ¹²⁸ ₇₂	τ	2.4 ^d		Cs(240-Mev p)		
		ϵ	100%		p 3.5 ^m Cs chem		
			See Cs ¹²⁸ for possible γ 's				
			R.W.Fink, E.O.Wilg, Phys. Rev. 91, 194 (1953).				
56	Ba ¹²⁹ ₇₃	β^+	1.6		Ca(80-Mev p) s chem		
			R.W.Fink, E.O.Wilg, Phys. Rev. 91, 194 (1953).				
56	Ba ¹³¹ ₇₅	τ	11.8 ^d		Ba ¹³⁰ (pile n)		
		γ		<u>K/L</u>	<u>K/L</u>		
			0.055	≤ 1	0.249	≥ 8	
			0.079	10	0.374	6.0	
			0.092		0.489		
			0.124	3.6	0.498	7.7	
			0.133	5.8	0.585		
			0.216	9	0.620		
			0.239	≥ 8			s ce ⁻ , pe ⁻
			No 0.82 or 1.2 γ				
			J.M.Cork, J.M.LeBlanc, W.H.Nester, M.K.Brice, Phys. Rev. 91, 76; 91, 497A (1953).				
		γ	w	~0.10	Ba(pile n)		
			55†	0.122	chem	scin	
			45†	~0.220			
			25†	0.370			
			100†	0.500			
			6†	0.620			
			3†	0.90*			
			3†	1.02*			
		x	145†	K x ray			
			(0.12 γ) (0.50 γ)				
			*Possible impurities				
			W. Payne, M.Goodrich, Phys. Rev. 91, 497A (1953); verbal report.				
56	Ba ¹³³ ₇₇	γ	0.276		Ba(pile n)		
39	h		J.M.Cork, J.M.LeBlanc, W.H.Nester, M.K.Brice, Phys. Rev. 91, 76 (1953).				
56	Ba ¹³⁵ ₇₉	γ	0.268		Ba(pile n)		
29	h		J.M.Cork, J.M.LeBlanc, W.H.Nester, M.K.Brice, Phys. Rev. 91, 76 (1953).				
	La	No neutron resonances				$E_n=0.1$ to 30 ev	
		V.L.Sailor, H.H.Landon, H.L.Foote, Phys. Rev. 91, 450A (1953).					
	La ¹⁴²	β^-	>2.5		U(n,f) chem; a		
57	85	γ	90†	0.63	scin		
			10†	0.87			
			(<2.5 β) (γ).				
			A.V.Bosch, Physica 19, 374 (1953).				

Ce	No neutron resonances			$E_n=0.1$ to 30 ev
	V.L.Sailor, H.H.Landon, H.L.Foote, Phys. Rev. 91, 450A (1953).			
Pr	No neutron resonances			$E_n=0.1$ to 30 ev
	V.L.Sailor, H.H.Landon, H.L.Foote, Phys. Rev. 91, 450A (1953).			
Pr ¹⁴⁰ 59 81	β^+	2.4	Pr(≤ 70 -Mev γ) scin F.I.Boley, Iowa State Coll. J. Sci. 27, 129 (1953).	
Pr ¹⁴⁴ 59 85	$\gamma\gamma$ polarization - direction I = 1-, 2+, 0+			scin
	D.M.Roberts, Phys. Rev. 91, 497A (1953); verbal report.			
Nd	Relative abundances			
	A	142	143	144 145
	%	27.09	12.14	23.83 8.29
	A	146	148	150
	%	17.26	5.74	5.63
	W.H.Walker, H.G.Thode, Phys. Rev. 90, 447 (1953).			
Eu	Neutron resonances (ev)			$E_n=0.1$ to 30 ev
		0.46	2.72	7.32
		1.06	3.35	8.95
		1.77	3.85	15.2
		2.47	6.2	20
	V.L.Sailor, H.H.Landon, H.L.Foote, Jr., Phys. Rev. 91, 450A (1953); verbal report.			
Eu ¹⁴⁷ 63 84	τ	24 ^d	Sm ¹⁴⁷ (6.7-Mev p)	
	γ	0.12	scin	
		0.21	87† ce ⁻	
	No β^+			
	R.C.Mack, J.J.Neuer, M.L.Pool, Phys. Rev. 91, 497A (1953).			
Eu ¹⁴⁸ 63 85	τ	54 ^d	Sm ¹⁴⁸ (6.7-Mev p)	
	γ	0.58	87† ce ⁻	
	R.C.Mack, J.J.Neuer, M.L.Pool, Phys. Rev. 91, 497A (1953).			
Eu ¹⁴⁹ 63 86	τ	120 ^d	Sm ¹⁴⁹ (6.7-Mev p)	
	γ	0.30	scin, 87† ce ⁻	
		0.57		
	R.C.Mack, J.J.Neuer, M.L.Pool, Phys. Rev. 91, 497A (1953); verbal report.			
Eu ¹⁵⁰ 63 87	τ	13.7 ^h	Sm ¹⁵⁰ (6.7-Mev p)	
	β^-	1.07	87†	
	No β^+			
	F-K plot complex? but no γ , no ce ⁻			
	R.C.Mack, J.J.Neuer, M.L.Pool, Phys. Rev. 91, 903; 91, 497A (1953).			
Gd	Neutron resonances (ev)			$E_n=0.7$ to 1000 ev
		1.93	14.4	49
		2.58*	16.6	81
		2.85*	20.6*	109

Gd		6.26	22.2*	355
		7.74	29.8	740
		11.6	33.2	
		$E_0=2.58$ $\sigma_0=1600$ $\Gamma=0.07$ eV		
		* Most prominent		
		R.R.Palmer, L.M.Bollinger, Phys. Rev. 91,450A (1953); verbal report.		
Gd ¹⁵⁰	τ_a	>10 ⁵ y		1c cc
64 86		No α daughter from 13.7 ^h Eu found		
		R.C.Mack, J.J.Neuer, M.L.Pool, Phys. Rev. 91,903 (1953).		
Tb ¹⁵⁷	τ	>100 ^y or <30 ^m		
65 92		Not observed from Tb (24-MeV p) or α d of 8.2 ^h Dy		
		T.H.Handley, E.L.Olson, Phys. Rev. 90,500 (1953).		
Dy	Neutron resonances (eV)	$E_n=0.1$ to 30 eV		
		1.72	5.47	16.8
		2.72	7.8	19.5
		3.7	10.6	29.5
		4.3	13.5	38.5
		V.L.Sallier, H.M.Landon, M.L.Foote, Jr., Phys. Rev. 91, 450A (1953); Verbal report.		
Dy ¹⁵⁷	τ	8.2 ^h	Tb (19-MeV p)	
66 91	γ	0.325	ion chem, rel σ	
		No β^+ or e^- observed		scin
		T.H. Handley, E.L.Olson, Phys. Rev. 90,500(1953).		
Dy ¹⁶⁵	γ	0.1080	Dy(pile n)	
66 99			K : L _{II} : L _{III} : M : N	
1.3 ^m			3 : 10 : 10 : 5: 1.5	
		0.155?	scin, $\pi\pi^-$ ce ⁻	
		0.361		
		0.515		
		($\sim 1\beta$) (0.36 γ ,0.52 γ) No (0.36 γ) (0.52 γ)		
		W.C. Jordan, J.M.Cork, S.B.Burson, Phys. Rev. 91, 497A (1953); verbal report.		
2.4 ^h	γ	0.0944	Dy(pile n)	
			K : L : M	
			60 : 7.8 : 1.5	
		0.279	K/L >5 $\pi\pi^-$ ce ⁻	
		0.361	K/L >5	
		0.634		
		0.71		
		1.02		
		($\sim 0.3\beta$) (0.28 γ ,0.36 γ ,0.63 γ)		
		($\sim 1.3\beta$) (0.094 γ)		
		(0.28 γ) (0.71 γ) (0.36 γ) (0.63 γ) No other $\gamma\gamma$		
		W.C. Jordan, J.M.Cork, S.B.Burson, Phys. Rev. 91, 497A (1953).		
Hf	Relative abundances		HfF ₄ ; ms	
	A	174	176	177
	%	0.199	5.23	18.55
	A	178	179	180
	%	27.23	13.73	35.07
		J.H.Reynolds, Phys. Rev. 90, 1047 (1953).		

Ta ¹⁸²	γ	0.22	0.29	1.23	sl pe ⁻
73 109		0.25	0.31	1.24	
117 ^d		0.27	1.01		
		0.28	1.13		
R.M. Pearce, K.C. Mann, Can. J. Phys. 31, 592 (1953).					
W ¹⁸⁵	No 0.134 γ			W (pile n)	
74 111				scin, $\pi\pi^-$ ce ⁻	
N. Lazar, R.J.D. Moffat, L.M. Langer, Phys. Rev. 91, 498A (1953).					
Re ¹⁸⁶	β^-	0.08%	(~ 0.3)		
75 111					
J.E. Robinson, C.E. Whittle, P.S. Jastram, Phys. Rev. 91, 498A (1953).					
(0.93 β) (0.14 γ) (θ) b < 0.0007					
C.E. Whittle, J.P. Hurley, P.S. Jastram, Phys. Rev. 91, 498A (1953); verbal report.					
Au ¹⁹⁷	γ		d 23 ^h Hg	$\pi\pi^-$ ce ⁻ ; scin	
79 118	IT	0.130	K : L _I : L _{II} : L _{III} : M	$\alpha_K \leq 2$	
7.4 ^s			10 : < 2 : ~ 64 : 21 : 36	E3	
		0.279	K : L	$\alpha_K \sim 0.27$	
			> 60 : 10	M1	
0.191 γ , 0.077 γ , previously assigned to decay of 23 ^h Hg through 7.4 ^s Au, now assigned to 65 ^h Hg decay. New assignment based on above E3 0.130 γ , now resolved from 0.134 γ , and on new threshold for Au(n,n') 7.4 ^s Au of < 0.42 .					
J.W. Mihelich, A.de-Shalit, Phys. Rev. 91, 78 (1953); * H.C. Martin, Ibid.					
Au ¹⁹⁸	γ	(0.68)	(E) 2 60%	(M) 1 40%	
79 119	(0.68 γ) (0.41 γ)		I = 2, 2, 0	$\gamma\gamma$ (θ)	
D. Schiff, F.R. Metzger, Phys. Rev. 90, 849 (1953).					
Hg	Neutron resonances (ev)		$E_n = 0.7$ to 1500 ev		
		23.1*	91	311*	
		33.3*	127	437	
		42.8	175*	1230	
		71	204		
* Most prominent					
R.R. Palmer, L.M. Bollinger, Phys. Rev. 91, 450A (1953).					
Hg ¹⁹⁷	γ		Au ¹⁹⁷ (p,n)	$\pi\pi^-$ ce ⁻	
80 117			L _I : L _{II} : L _{III}		
23 ^h		0.134	0.4 : 11 : 10	E2	
		0.165	10 : < 1 : 15	M4	
65 ^h		0.0774*	100 : 45 : 34	M1+E2	
		0.191*	K/L = 6		
* Previously assigned to 7.4 ^s Au, Q.V.					
J.W. Mihelich, A.de-Shalit, Phys. Rev. 91, 78 (1953)					
Tl ²⁰³	$\mu(Tl^{203})/\mu(Tl^{205})$	= 0.990258			I
81 122		± 0.000001			
Resonance frequencies depend on anions in solution; shifts same for Tl ²⁰³ , Tl ²⁰⁵					
M.S. Gutowsky, B.R. Garvey, Phys. Rev. 91, 81 (1953)					

Tl ²⁰⁸	No 5.1 β (<0.2%)			
81 127	P.E. Cavanagh, quoted by P. Marín, G.R. Bishop, H. Halban, Proc. Phys. Soc. 66A, 608 (1953).			
Pb ²⁰⁷	τ	0.9 ^s	d 50 ^y B1	chem
82 125	G. Friedlander, E. Wilson, A. Ghiorso, I. Perlman, Phys. Rev. 91, 498A (1953).			
Pb ²¹²	τ	10.64 ^h \pm 0.03		
82 130	Measured for 3 half-lives with 1c			
	P. Marín, G.R. Bishop, H. Halban, Proc. Phys. Soc. 66A, 608 (1953).			
Pb ²¹⁴	γ	0.292	sl pe ⁻	
82 132		0.350		
	R.W. Pearce, K.C. Mann, Can. J. Phys. 31, 592 (1953).			
Bi ²¹²	α	35.4%		1c
83 129	β^-	64.6%		
	P. Marín, G.R. Bishop, H. Halban, Proc. Phys. Soc. 66A, 608 (1953).			
Bi ²¹⁴	γ	0.452 0.932 1.750		
83 131		0.500 1.123 1.800		
		0.607 1.236 2.192		
		0.783 1.400		
		0.860 1.525	sl pe ⁻	
	R.W. Pearce, K.C. Mann, Can. J. Phys. 31, 592 (1953).			
Po ²¹¹	Not parent 0.8 ^s Pb (< 0.003%) chem			
84 127	G. Friedlander, E. Wilson, A. Ghiorso, I. Perlman, Phys. Rev. 91, 498A (1953).			
Po ²¹⁸	β^-	0.022%		1c
84 134	F. Hiesberger, B. Karlik, Sitzber. Akad. Wiss. Wien, Math.-naturw. Kl. Abt. II a 161, 51 (1952).			
Ra ²²³	τ	11.1 ^d	Rn ²²² (pile n ₀ 7/45)	chem
88 135	A.P. Baerg, Phys. Rev. 90, 1121 (1953).			
Ac ²²⁸	β^-	13% 0.45	d Ra ²²⁸ st $\beta\gamma$	
89 139		8% 0.64	chem	
		53% 1.11		
		7% 1.70		st
		9% 1.85		
		10% 2.18		
	γ	0.0567	st ce ⁻	
		0.078		
		0.0978 0.232 0.965		
		0.113 0.336 1.035		
		0.1275 0.410 1.095		
		0.179 0.458 1.587		
		0.184 0.907 1.640		
	(0.45 β , 0.64 β) (>1.1 γ) (1.11 β) (~1 γ)			
	(1.70 β , 1.85 β) (>0.9 γ) No (2.18 β) (γ)			
	(0.098 ce ⁻ , 0.127 ce ⁻ , 0.184 ce ⁻) (γ)			
	No (0.127 ce ⁻) (0.184 ce ⁻) No (>0.9 γ) (>0.9 γ)			
	(~0.45 γ) (~1.0 γ) (~0.9 γ) (<0.4 γ)			
	No (~0.45 γ) (>1.1 γ)			

⁸⁹ Ac ²²⁸ ₁₃₉	No β (soft e ⁻) delay observed; implies 500 μ s > γ (0.057 γ) > 0.1 μ s or > 0.01 ^s			
	J. Kyles, C.G. Campbell, W.J. Henderson, Proc. Phys. Soc. 66A, 519 (1953).			
Th ²²⁸ 90 138	γ	100 ⁺ (0.083) 14 ⁺ 0.133 10 ⁺ 0.172 17 ⁺ 0.216	Th ²²⁸ extracted from Ra ²²⁸	scin
Decay products continuously removed				
G. Boulassieres, P. Falk-Valrant, M. Riou, J. Tellier, C. Victor, Compt. rend 236, 1874 (1953).				
Th ²³⁰ 90 140	γ	33 ⁺ (0.067) 4 ⁺ 0.150 ~0.3 ⁺ 0.20 ⁺ 1 ⁺ 0.254	9% Th ²³⁰	scin
	α	860 ⁺ L x ray		
+Photons per 10 ⁴ disintegrations				
G. Boulassieres, P. Falk-Valrant, M. Riou, J. Tellier, C. Victor, Compt. rend. 236, 1874 (1953).				
	α	~0.03% 4.44 ~0.12% 4.47 (25%) (4.612) (75%) (4.682) (4.47 α) (ce ⁻) (4.61 α) (ce ⁻) No (4.44 α) (ce ⁻) No (4.68 α) (ce ⁻)	~100% Th ²³⁰	ms 1c
G. Valladas, R. Bernas, Compt. rend. 236, 2230 (1953)				
Th ²³⁴ 90 144	β^-	33% 0.103 67% 0.193	Th ²³⁴ + Pa ²³⁴ source	st 2
	γ	0.0294 0.0431 0.0471? 0.0630 0.0914 0.1002	L ₁ :M ₁ :N ₁ = 83:21:5.7	st 2 ce ⁻
	[ce ⁻ _{L1} (0.091 γ)]/ β = 0.083			
	γ 's could belong to Pa ²³⁴			
P.H. Stoker, M. Heerschap, O.P. Mok, Physica 19, 433 (1953).				
Pa ²³¹ 91 140	γ	(0.027)	$\tau=4.2 \times 10^{-6}$ s $\alpha\gamma$ $\alpha_L \sim 7$ E1 a	
J. Tellier, M. Riou, P. Desnelges, Compt. rend. 237, 41 (1953).				
Pa ²³⁴ 91 143 1.14 ^m	β^-	1% 0.580 9% 1.500 90% 2.305	Th ²³⁴ +Pa ²³⁴ source	st 2
	γ	0.229 0.316 0.810 0.845 0.877	converted in Pa $\alpha_K \sim 0.06$ K/L = 5.2	
	No 0.395 γ (ce ⁻ _{LW})/ $\beta^- < 3 \times 10^{-4}$)			
	See Th ²³⁴ for possible γ 's			
P.H. Stoker, M. Heerschap, O.P. Mok, Physica 19, 433 (1953).				

NEUTRON CROSS SECTIONS

Reaction	σ Type	Value	Energy	Ref.
H(n)	σ_a	0.332±0.007	th	53h8
	σ_a	0.329±0.004	th	53h7
	σ_t	4.23	1.001	53f4
	σ_t	3.675±0.020	1.311	53f6
	σ_t	0.034	400	53n2
H ² (n,n)	σ_{e1}	table	0.135-0.914	53t4
	$d\sigma_{e1}/d\Omega$	graphs	0.135-0.914	53t4
	$d\sigma_{e1}/d\Omega$	graphs	0.2-2.5	53a2
H ² (n)	σ_t	graph	0.2-3.0	53a2
He(n)	σ_t	0.232	400	53n2
B(n)	σ_a	753	th	53c10
	Extrapolated value. $E_n=0.025$ to 0.00068 ev			
	Isotopic composition not given			
C(n,n')	$\sigma(\sim 3\text{-Mev } \gamma's)$	0.2	14	53b5
	$\sigma(\sim 5\text{-Mev } \gamma's)$	0.09	14	53b5
C(n)	σ_t	graph	0.05-1	53k6
	σ_t	graph	2.2-2.8	53d4
	σ_t	0.298	400	53n2
	$\sigma(\text{spallation})$		90	53k5
C ¹³ (n, γ)	$\sigma(5700^{\circ}\text{C})$	≤0.01	th	53b11
O(n,n')	$\sigma(\sim 7\text{-Mev } \gamma's)$	0.14	14	53b5
O(n)	σ_t	1.68	14	53a1
	σ_t	0.379	400	53n2
Na(n)	σ_t	graph	2.3-2.8	53d4
Al(n,n')	$\sigma(\sim 2\text{-Mev } \gamma's)$	~2	14	53b5
	$\sigma(\sim 6\text{-Mev } \gamma's)$	~0.3	14	53b5
Al(n)	σ_t	1.86	14	53a1
	σ_t	0.588	400	53n2
P(n)	σ_t	graph	0.1-0.7	53a4
S(n)	σ_t	0.681	400	53n2
Cl(n)	σ_t	graph	0.1-0.7	53a4
	σ_t	graph	0.15-1	53k6
	σ_t	graph	2.2-2.8	53d4

Neutron Cross Sections - Continued

Reaction	σ Type	Value	Energy	Ref.
Cl(n)	σ_t	0.743	400	53n2
Cl ³⁵ (n, α)	$\sigma(\alpha)$	graph	3-4	53a4
A ³⁶ (n, α)	$\sigma(\alpha_0)^*$	table	2.1-4.4	53t5
	$\sigma(\alpha_1)^*$	table	2.1-4.4	53t5
* α_0 to g.s. S ³³ ; α_1 to 1.1-Mev level S ³³				
A(n)	σ_t	graph	0.4-1.1	53g4
Ca ⁴⁶ (n, γ)	$\sigma(3.4^d\text{Sc})$	0.25	th	53c6
Sc(n,n)	σ_s coh	18	0.062	53m7
Sc(n)	σ_t	24	0.062	53m7
Tl(n)	σ_t	graph	2.2-2.8	53d4
Fe(n,n)	σ_s incoh	0.43		53g5
	σ_s free	11.39		53g5
	σ_{e1}	2.0	1.0	53w3
Fe(n)	$d\sigma_{e1}/d\Omega$	graph	1.0	53w3
	σ_t	1.07	400	53n2
Co ⁵⁹ (n, γ)	$\sigma(10.7^m\text{Co})$	19	th	53m8
	$\sigma(10.7^m\text{Co})$	<0.008	~0.025	53k4
Ni(n,n)	σ_s coh	12.9		53g5
	σ_s free	17.43		53g5
	σ_{e1}	2.8	1.0	53w3
Ni(n)	$d\sigma_{e1}/d\Omega$	graph	1.0	53w3
	σ_{e1}	2.9	1.0	53w3
Cu(n,n)	$d\sigma_{e1}/d\Omega$	graph	1.0	53w3
	σ_t	1.19	400	53n2
Cu ⁶³ (n, γ)	$\sigma(12.9^h\text{Cu})$	0.12	~0.025	53k4
Zn(n)	σ_{e1}	3.3	1.0	53w3
	$d\sigma_{e1}/d\Omega$	graph	1.0	53w3
Ge ⁷⁴ (n, γ)	$\sigma(82^m\text{Ge})$	0.038	~0.025	53k4
Br(n)	σ_t	graph	2.2-2.8	53d4
Rh(n)	σ_s free	5.5	1.26 ev	53s7
Pd ¹⁰² (n, γ)	$\sigma(17^d\text{Pd})$	4.8	pile	53m5
Ag(n,n)	σ_{e1}	4.2	1.0	53w3

Neutron Cross Sections - Continued

Reaction	σ Type	Value	Energy	Ref.
Ag(n,n)	$d\sigma_{el}/d\Omega$	graph	1.0	53w3
Cd(n,n)	σ_{el}	5.2	1.0	53w3
	$d\sigma_{el}/d\Omega$	graph	1.0	53w3
Cd(n)	σ_t	1.85	400	53n2
In(n,n)	σ_{el}	6.1	1.0	53w3
	$d\sigma_{el}/d\Omega$	graph	1.0	53w3
Sn(n,n)	σ_{el}	6.0	1.0	53w3
	$d\sigma_{el}/d\Omega$	graph	1.0	53w3
NaI(n)	σ_a	7.4	th	53h7
Nd ¹⁴² (n)	σ_a	13	pile	53w4
Nd ¹⁴³ (n)	σ_a	334	pile	53w4
Nd ¹⁴⁴ (n)	σ_a	~0	pile	53w4
Nd ¹⁴⁵ (n)	σ_a	37	pile	53w4
Nd ¹⁴⁶ (n)	σ_a	~4	pile	53w4
Nd ¹⁴⁸ (n)	σ_a	~4	pile	53w4
Nd ¹⁵⁰ (n)	σ_a	~0	pile	53w4
Hf(n,n)	σ_a	4.7	1.0	53w3
	$d\sigma_{el}/d\Omega$	graph	1.0	53w3
Au(n)	σ_a	97.5	th	53c10
Extrapolated value assuming $1/v$. $E_n = 0.0035$ to 0.00068 ev				
	σ_t	graph	0.1-0.7	53s4
Pb(n,n)	σ_{el}	4.6	1.0	53w3
	$d\sigma_{el}/d\Omega$	graph	1.0	53w3
Pb(n)	σ_t	2.89	400	53n2
Bi(n,n)	σ_{el}	4.8	1.0	53w3
	$d\sigma_{el}/d\Omega$	graph	1.0	53w3
Rn ²²² (n)	$\sigma(11.2^d \text{Ra}^{223})$	0.7	pile	53b9
Th(n)	σ_t	3.23	400	53n2
U(n)	σ_t	3.26	400	53n2

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GROUND STATE Q'S

Reaction	Standard	Value	Method	Ref.
$\text{H}^2(\text{d}, \text{n})\text{He}^3$		$+3.25 \pm 0.06$	ppl	53d5
$\text{H}^3(\text{d}, \text{n})\text{He}^4$		$+17.7 \pm 0.3$	ppl	53r3
$\text{He}^5 \rightarrow \alpha + \text{n}$		$+0.95 \pm 0.07$	range	53m6
$\text{Li}^6(\text{d}, \text{t})\text{Li}^5$		$+0.9 \pm 0.1$	s	53f5
$\text{Li}^6(\text{d}, \text{tp})\text{He}^4$		$+2.51 \pm 0.04$	s	53f5
$\text{Li}^6(\text{d}, \alpha)\text{He}^4$		$+22.375 \pm 0.014$	s	53p2
$\text{Li}^7(\text{p}, \alpha)\text{He}^4$		$+17.344 \pm 0.013$	s	53p2

Ground State Q's - Continued

Reaction	Standard	Value	Method	Ref.
$\text{Li}^7(p,n)\text{Be}^7$	$\left\{ \begin{array}{l} \text{Na } \gamma \\ [\text{Mg}(p,p')] \end{array} \right\}$	-1.6464	thresh	53j1
		± 0.0009		
$\text{Li}^7(d,\alpha)\text{He}^5$		+14.2 ± 0.1	ppl	53c8
$\text{Be}^9(n,\gamma)\text{Be}^{10}$	absolute	+6.816 ± 0.006	pair s	53k7
$\text{B}^{10}(d,\alpha)\text{Be}^8$		+17.87 ± 0.06	s	53c9
$\text{B}^{11}(d,p)\text{B}^{12}$		+1.140 ± 0.008	s	53e4
$\text{C}^{12}(d,p)\text{C}^{13}$		+2.722 ± 0.004	s	53p2
$\text{C}^{13}(d,\alpha)\text{B}^{11}$		+5.166 ± 0.005	s	53p2
$\text{N}^{14}(n,\gamma)\text{N}^{15}$	absolute	+10.832 ± 0.008	pair s	53k7
$\text{O}^{16}(d,\alpha)\text{N}^{14}$		+3.119 ± 0.005	s	53p2
$\text{Mg}^{24}(n,\gamma)\text{Mg}^{25}$	absolute	+7.334 ± 0.007	pair s	53k8
$\text{Mg}^{26}(n,\gamma)\text{Mg}^{27}$	absolute	+6.440 ± 0.008	pair s	53k8
$\text{Al}^{27}(n,\gamma)\text{Al}^{28}$	absolute	+7.724 ± 0.006	pair s	53k7
$\text{Si}^{28}(\gamma,n)\text{Si}^{27}$		-16.9 ± 0.2	thresh	53s8
$\text{Si}^{28}(n,\gamma)\text{Si}^{29}$	absolute	+8.468 ± 0.008	pair s	53k7
$\text{Si}^{28}(p,n)\text{P}^{28}$	$\text{Mg}^{24}(p,n)$	-15.1 ± 0.5	thresh	53g3
$\text{Si}^{29}(n,\gamma)\text{Si}^{30}$	absolute	+10.601 ± 0.011	pair s	53k7
$\text{S}^{32}(p,n)\text{Cl}^{32}$	$\text{Mg}^{24}(p,n)$	-13.9 ± 0.5	thresh	53g3
$\text{Cl}^{35}(n,\alpha)\text{P}^{32}$	$\text{Po}^{212}\alpha$	+0.97 ± 0.16	1c	53a3
$\text{A}^{36}(n,\alpha)\text{S}^{33}$		+2.0 ± 0.1	pc	53t5
$\text{K}^{39}(\alpha,p)\text{Ca}^{42}$		-0.18	range	53s5
$\text{K}^{41}(\alpha,p)\text{Ca}^{44}$		+1.20	range	53s5
$\text{Ca}^{40}(\gamma,n)\text{Ca}^{39}$		-15.8 ± 0.1	thresh	53s8
$\text{Ca}^{40}(d,p)\text{Ca}^{41}$	$\text{O}^{16}(d,p)$	+6.14 ± 0.05	ppl	53h9
$\text{Ca}^{48}(p,n)\text{Sc}^{48}$	$\left\{ \begin{array}{l} \text{F}^{19}(p,\alpha\gamma) \\ \text{Li}^7(p,n) \end{array} \right\}$	≥ 0.64	thresh	53t6
$\text{Ti}^{49}(p,n)\text{V}^{49}$	$\left\{ \begin{array}{l} \text{F}^{19}(p,\alpha\gamma) \\ \text{Li}^7(p,n) \end{array} \right\}$	-1.391 ± 0.005	thresh	53t6
$\text{V}^{51}(n,\gamma)\text{V}^{52}$	$\left\{ \begin{array}{l} \text{Au}, \text{Cs} \\ \text{Na } \gamma\text{'s} \end{array} \right\}$	+7.4	scin	53h8
$\text{Mn}^{55}(p,n)\text{Fe}^{55}$	$\left\{ \begin{array}{l} \text{F}^{19}(p,\alpha\gamma) \\ \text{Li}^7(p,n) \end{array} \right\}$	-1.020 ± 0.005	thresh	53t6
$\text{Cu}^{63}(\gamma,n)\text{Cu}^{62}$	Q value masses	-10.61 ± 0.05	thresh	53b7

Ground State Q's - Continued

Reaction	Standard	Value	Method	Ref.
$\text{Zn}^{64}(p,n)\text{Ga}^{64}$	$\left\{ \begin{array}{l} \text{Cu}^{63}(p,n) \\ \text{Zn}^{66}(p,n) \end{array} \right\}$	-8.0 ± 0.5	thresh	53c7
$\text{Zn}^{67}(p,n)\text{Ga}^{67}$	$\left\{ \begin{array}{l} \text{F}^{19}(p,\alpha\gamma) \\ \text{Li}^7(p,n) \end{array} \right\}$	-1.785 ± 0.005	thresh	53t6
$\text{Zn}^{70}(p,n)\text{Ga}^{70}$	"	-1.45 ± 0.03	thresh	53t6
$\text{Ga}^{71}(p,n)\text{Ge}^{71}$	"	-1.03 ± 0.03	thresh	53t6
$\text{Ge}^{73}(p,n)\text{As}^{73}$	"	-1.15 ± 0.03	thresh	53t6
$\text{As}^{75}(p,n)\text{Se}^{75}$	"	-1.652 ± 0.005	thresh	53t6
$\text{Sr}^{88}(d,p)\text{Sr}^{89}$	$\text{O}^{16}(d,p)$	+4.18 ± 0.08	ppl	53h9
$\text{Mo}^{100}(\gamma,n)\text{Mo}^{99}$		-8.1	thresh	53d6
$\text{Ag}^{109}(\gamma,n)\text{Ag}^{108}$	Q value masses	-9.07 ± 0.07	thresh	53b7
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